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THE HONORARY SECRETARIES.

“It will flourish, if naturalists, chemists, antiquaries, philologers, and men of science in different parts of *Asia*, will commit their observations to writing, and send them to the Asiatic Society at Calcutta. It will languish, if such communications shall be long intermitted; and it will die away, if they shall entirely cease.” SIR WM. JONES.

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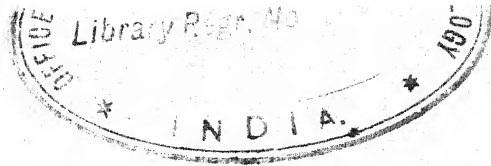
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# JOURNAL OF THE ASIATIC SOCIETY.

## Part II.—PHYSICAL SCIENCE.

No. I.—1873.

### ON DIFFERENTIAL GALVANOMETERS,— by LOUIS SCHWENDLER.

(Continued from page 152, Vol. XLI, Part II, 1872.)\*

The first part of this investigation concluded with the following question :

*What general condition must be fulfilled in the construction of any differential galvanometer in order to make a simultaneous maximum possible with respect to an alteration of external resistance in either of the differential branches ?*

To answer this question, it will be necessary to remember, that the condition of a simultaneous maximum sensitiveness at or near balance was expressed by 3 equations, namely,—

$$\frac{(w-g)(w'+g')+f(w+w'+g'-g)}{p(g-w)g'} = \frac{2(g+w+f)}{2\sqrt{g}\sqrt{g'}-p(g+w)} \dots \text{II}$$

$$\frac{(w'-g')(w+g)+f(w+w'+g-g')}{\frac{(g'-w')}{p} \cdot g} = \frac{2(g'+w'+f)}{2\sqrt{g}\sqrt{g'}-\frac{g'+w'}{p}} \dots\dots \text{II'}$$

and

$$g' + w' - p \frac{\sqrt{g'}}{\sqrt{g}} (g + w) = 0 \dots\dots\dots \text{I}$$

$g$  and  $g'$  being the resistances of the two differential coils,  $w$  and  $w'$  the two resistances at which balance actually arrives,  $f$  the total resistance in the battery branch, and  $p$  an absolute number expressing what was termed the

\* Read before the Asiatic Society of Bengal, 6th March, 1872.

"mechanical arrangement" of the differential galvanometer under consideration.

By these three equations, which are independent of each other,  $g$ ,  $g'$  and  $p$  can be expressed in terms of  $w$ ,  $w'$  and  $f$ .

By equation I we have at or very near balance :

$$p = \frac{g' + w'}{g + w} \cdot \frac{\sqrt{g}}{\sqrt{g'}} \text{ which value substituted in equations II and II'}$$

gives :

$$\frac{(w - g)(w' + g') + f(w + w' + g' - g)}{(g' + w')(g - w)g'} = \frac{2(g + w + f)}{(g' - w')(g + w)} \dots \text{II}$$

and

$$\frac{(w' - g')(w + g) + f(w + w' + g - g')}{(g + w)(g' - w')g} = \frac{2(g' + w' + f)}{(g - w)(g' + w')} \dots \text{II'}$$

and from these two equations  $g$  and  $g'$  may be developed.

This is best done by subtracting equation II from equation II' when after reduction we get :—

$$(w'g - wg')(w'g + wg' + gg' + ww') = -f(g + g' + w + w')(w'g - wg') \quad \text{III}$$

Now it must be remembered, that with respect to our physical problem,  $f$ ,  $w$ ,  $w'$ ,  $g$  and  $g'$  represent nothing else, but electrical resistances, and that they have, therefore, to be taken in any formula as quantities of the same sign (say positive).

Consequently the above equation III would contain a mathematical impossibility (a positive quantity equal to a negative quantity), whenever the common factor  $w'g - wg'$  is different from zero.

In other words equation III can only be fulfilled if we always have :

$$w'g - wg' = 0 \dots \text{IV}$$

This simple relation between the resistances at which balance arrives and the resistances of the two differential coils, expresses not only the necessary and sufficient condition under which a simultaneous maximum sensitiveness can exist, but it also affords an easy means of getting at once those special values of  $g$ ,  $g'$  and  $p$ , which only solve the physical problem.

Substituting the value of either  $g$  or  $g'$ , as given by equation IV in equations II and II' and developing  $g$  and  $g'$  we have :

$$*g = -\frac{1}{3} \left( w + f \frac{(w + w')}{2w'} \right) + \frac{2}{3} \sqrt{w^2 + \frac{w}{w'}(w + w')f + \frac{(w + w')^2}{16w'^2}f^2} \dots a.$$

$$*g' = -\frac{1}{3} \left( w' + f \frac{(w + w')}{2w} \right) + \frac{2}{3} \sqrt{w'^2 + \frac{w'}{w}(w + w')f + \frac{(w + w')^2}{16w^2}f^2} \dots b.$$

the negative signs of the square roots having been omitted since they would

\* See note at end.

obviously make  $g$  and  $g'$  negative, values which cannot solve the physical question.—

Further, if we introduce the ratio

$\frac{g'}{g} = \frac{w'}{w}$ , given by equation IV, into equation I, and develope  $p$  we get :

$$p^2 = \frac{w'}{w} \dots\dots\dots c.$$

This latter expression shows the very simple relation which must exist between the *mechanical arrangement* of any differential galvanometer and the two resistances at which balance is arrived at, in order to make a simultaneous maximum sensitiveness possible.

Thus if the ratio of the two resistances at which balance arrives is fixed, the mechanical arrangement  $p$  cannot be chosen arbitrarily, but must be identical with this ratio. This is in fact the answer to the question put at the beginning of this paper.

However, the meaning of this result will be made even still clearer if we revert to equation I, by which we have

$$p \frac{\sqrt{g'}}{\sqrt{g}} = \frac{g' + w'}{g + w} = C \dots\dots\dots I.$$

expressing the ratio between the total resistances in the two differential branches, when balance is established, and which ratio is generally known under the name *Constant of the Differential Galvanometer*.

Substituting in the above expression I the value of  $\frac{g'}{g} = \frac{w'}{w}$  from equation IV we get at once

$$\frac{w'}{w} = C \dots\dots\dots d.$$

and as a second answer to the question put at the beginning of this paper we have therefore :

*A simultaneous maximum sensitiveness with respect to an alteration of external resistance in either branch of any differential galvanometer can be obtained only, if the constant of the differential galvanometer is equal to the ratio of the two resistances at which balance arrives, and this clearly necessitates that the resistances of the respective coils to which  $w$  and  $w'$  belong should stand in the same ratio.*

The general problem may now be considered as solved by the following four general expressions :

$$g = -\frac{1}{2} \left( w + f \frac{(w + w')}{2w'} \right) + \frac{2}{3} \sqrt{w^2 + \frac{w}{w'} (w + w') f + \frac{(w + w')^2}{16w'^2} f^2} \dots a.$$

$$g' = \frac{w'}{w} g \dots\dots\dots b.$$

$$p^2 = \frac{w'}{w} \dots\dots\dots c.$$

$$C = \frac{w'}{w} \dots\dots\dots d.$$

*Additional remarks.*

In the foregoing it has not been shewn that the values  $g$  and  $g'$ , expressed by equations  $a$  and  $b$ , must necessarily correspond to a maximum sensitiveness of the differential galvanometer, because it was clear *à priori*, that the function by which the deflection is expressed is of such a nature that no minimum with respect to  $g$  and  $g'$  is possible. However, to complete the solution mathematically, the following is a very short proof that the values of  $g$  and  $g'$  really do correspond to a maximum sensitiveness of the differential galvanometer under consideration.

Reverting to one of the expressions for the deflection  $a^\circ$  which any differential galvanometer gives before balance is arrived at, we had :

$$a^\circ \propto K \frac{\sqrt{g}}{N} \Delta \text{ and as the increase of deflection at or near balance is}$$

identical with the deflection itself, and further as the law which binds the resistance of the differential coils to the other resistances in the circuit, in order to have a maximum sensitiveness, is of practical interest only when the needle is at, or very nearly at, balance, we can solve the question at once by making  $a^\circ$  a maximum with respect to  $g$  and  $g'$ , if we only suppose  $\Delta$  constant and small enough, and as  $K$  is known to be independent of  $g$  and  $g'$ ,

the deflection  $a^\circ$  will be a maximum if  $\frac{\sqrt{g}}{N}$  is a maximum for any constant  $\Delta$  (zero included).

Further we know that  $g' = Cg$  which value for  $g'$  in  $N$  substituted will make the latter a function of  $g$  only and consequently  $\frac{\sqrt{g}}{N}$  also. We have therefore to deal with a single maximum or minimum, and according to well-known rules we have :

$$\frac{da}{dg} = \frac{N - 2g \frac{dN}{dg}}{2\sqrt{g} N^2} = \frac{U}{V}$$

and

$$\frac{d^2a}{dg^2} = \frac{V \frac{dU}{dg} - U \frac{dV}{dg}}{V^2}$$

but

$$\frac{da}{dg} = 0 \quad \text{it follows that} \quad U = 0$$

$$\therefore \frac{d^2a}{dg^2} = \frac{1}{V} \frac{dU}{dg}$$

Now

$\frac{dU}{dg} = -\left(\frac{dN}{dg} + 2g \frac{d^2N}{dg^2}\right)$ , but  $\frac{dN}{dg}$  as well as  $\frac{d^2N}{dg^2}$  being invariably positive, it follows that  $\frac{dU}{dg}$  is invariably negative, and as further  $V$  is always positive it follows finally that  $\frac{d^2a}{dg^2}$  is always negative, or the value of  $g$  obtained by equation  $\frac{da}{dg} = 0$  corresponds to a maximum sensitiveness of the differential galvanometer.

In a similar way it can be shewn that the value of  $g'$  obtained by equation  $\frac{da}{dg'} = 0$  corresponds also to a maximum sensitiveness of the differential galvanometer.

This is in fact a second and far more simple solution of the problem. However, it is by no means as general, nor does it adhere as closely to the spirit of analysis as the first more complicated solution.

*Effect of Shunts.*—It is clear that the introduction of shunts cannot alter the general results as given in equations *a*, *b*, *c*, and *d*, as long as the shunts are used merely for the purpose of carrying off a fixed quantity of current without in themselves having any direct magnetic action on the needle.

However, to avoid misunderstanding, it is well to remember that in the case of shunts being used, the values to be given to  $w$  and  $w'$  in the above equations are *not* those at which balance actually arrives, but those at which balance would arrive if no shunts were used, *i. e.*, the resistance at which balance is established when using shunts must be multiplied by the multiplying power of their respective shunts, before they are to be substituted in the equations *a*, *b*, *c* and *d*.

*Mechanical arrangement designed by p.*—The condition which must be fulfilled in the construction of any differential galvanometer to make a simultaneous maximum sensitiveness possible was expressed by

$$p^2 = \frac{w'}{w} \dots\dots\dots c.$$

while  $p = \frac{m' n'}{m n}$  and it will be now instructive to enquire what special physical meaning equation *c* has.

By  $m$  was understood the magnetic effect of an average convolution (*i. e.* one of average size and mean distance from the magnet acted upon, when the latter is parallel with the plane of the convolutions) in the differential coil of resistance  $g$ , when a current of unit strength passes through it. Similarly  $m'$  was the magnetic effect of an average convolution in the other differential coil of resistance  $g'$ .

Further  $n$  and  $n'$  were quantities expressed by

$$U = n \sqrt{g}$$

and 
$$U' = n' \sqrt{g'}$$

$U$  and  $U'$  being the number of convolutions in the two coils  $g$  and  $g'$  respectively.

Now we will call  $A$  half the cross section of the coil  $g$  (cut through the coil normal to the direction of the convolutions) and which section, as the wire is to be supposed uniformly coiled, must be uniform throughout.

Thus we have generally

$$\frac{A}{c(q + \delta)} = U$$

wherever the normal cut through the coil is taken.

$c$  is a constant indicating the manner of coiling, either by dividing the cross-section  $A$  into squares, hexagons or in any other way, but always supposing that however the coiling of the wire may have been done, it has been done uniformly throughout the coil. (This supposition is quite sufficiently nearly fulfilled in practice because the coiling should always be executed with the greatest possible care, and further the wire can be supposed practically of equal thickness throughout the coil).

$q$  is the metallic section of the wire, and  $\delta$  the non-metallic section due to the necessary insulating covering of the wire.

Further we have

$g = U \frac{b}{q\lambda}$  where  $b$  is the length of an average convolution and  $\lambda$  the absolute conductivity of the wire material supposed to be a constant for the coil.

Now, for brevity's sake, we will suppose that  $\delta$ , the cross-section of the insulating covering, can be neglected against  $q$  the metallic cross-section of the wire.

Consequently we have

$$\frac{A}{cq} = U \text{ (approximately)}$$

and 
$$g = U \frac{b}{q\lambda}$$

$$\therefore U = \sqrt{\frac{A\lambda}{bc}} \cdot \sqrt{g}$$



or 
$$n = \sqrt{\frac{A\lambda}{bc}}$$

similarly 
$$n' = \sqrt{\frac{A'\lambda'}{b'c'}}$$

$$\therefore \frac{n'}{n} = \sqrt{\frac{A'\lambda' bc}{A\lambda b'c'}}$$

But using wire of the same conductivity in both the differential coils, which should be as high as is possible to procure it, and further supposing the manner of coiling to be identical in both coils, we have

$$\lambda = \lambda'$$

$$c = c'$$

$$\therefore \frac{n'}{n} = \sqrt{\frac{A'}{A} \cdot \frac{b}{b'}}$$

Further we know that if the shape and dimensions of each coil are given, and in addition also their distance from the magnet acted upon, it will be always possible to calculate  $m$  and  $m'$ , though it may often present mathematical difficulties, especially if the forms of the two coils differ from each other and are also not circular. This latter condition is generally necessitated in order to obtain the greatest absolute magnetic action of each coil in as small a space as possible.

However it is clear that we may assume generally that the two coils have each an average convolution of identical shape and of the same length, placed at an equal distance from the magnet acted upon, and that therefore the magnetic action of each coil is dependent on the number of convolutions only.

In this case we have evidently

$$m = m'$$

$$b = b'$$

$$\therefore \frac{n'}{n} = \sqrt{\frac{A'}{A}}$$

and as 
$$p = \frac{n'}{n} \cdot \frac{m'}{m}$$

we have finally

$$\frac{A'}{A} = \frac{w'}{w} \dots\dots\dots e.$$

Equation *e* shows at once that under the supposed conditions, *i. e.*, when the average convolutions in each coil are of equal size and shape, the wire used in either coil is of the same absolute conductivity, and that the thickness of the insulating material can be neglected against the diameter of the wire :

*The wire used for filling each coil must be invariably of the same diameter, otherwise a maximum sensitiveness is impossible.*

How the above simple law expressed by equation *e* would be altered, when the given suppositions were not fulfilled, must be found by further calculation, but as the latter is intricate and a more general result is not required in practice, I shall dispense at present with this labour.

*Special Differential Galvanometers.*—Here shall be given the special expressions to which the general equations *a*, *b*, *c* and *d*, are reduced when certain conditions are presupposed.

*1st case.*—When *w* and *w'*, the two resistances at which balance is arrived at are so large that *f*, the resistance of the testing battery can be neglected against either of them without perceptible error. Substituting therefore *f* = 0 in equations *a*, and *b*, we get :

$$g = \frac{w}{3} \dots\dots\dots a.$$

$$g' = \frac{w'}{3} \dots\dots\dots b.$$

and the other two remain as they are namely :

$$p^2 = \frac{w'}{w} \dots\dots\dots c.$$

$$C = \frac{w'}{w} \dots\dots\dots d.$$

*2nd case.*—When the battery resistance *f* cannot be neglected against either *w* or *w'*, but when the two resistances at which balance is arrived at are invariably equal.

Thus substituting in the general equation

$$w = w' = w$$

we get

$$g = g' = g = -\frac{w+f}{3} + \frac{1}{3}\sqrt{4w^2 + 8fw + f^2} \dots\dots\dots a, b.$$

$$p^2 = 1 \dots\dots\dots c.$$

$$C = 1 \dots\dots\dots d.$$

*3rd Case.*—When the conditions given under 1 and 2 are both fulfilled

or  $w = w' = w$

and  $f = 0$

then we have

$$g = g' = g = \frac{w}{3} \dots\dots\dots a, b.$$

$$p^2 = 1 \dots\dots\dots c.$$

$$C = 1 \dots\dots\dots d.$$

The very same result which was obtained by direct reasoning at the beginning of this paper.

*Applications.*—Though the problem in its generality has now been entirely solved, it will not perhaps be considered irrelevant to add here some applications.

For our purpose differential galvanometers may be conveniently divided into two classes, *viz.*, those in which the resistances to be measured vary within narrow limits, and those where these limits are extremely wide.

To the first class belong the differential galvanometers which are used for indicating temperature by the variation of the resistance of a metallic wire, exposed to the temperature to be measured. As for instance, C. W. Siemen's Resistance Thermometer for measuring comparatively low temperatures, or his Electric Pyrometer for measuring the high temperature in furnaces.

It is clear that for such instruments the law of maximum sensitiveness should best be fulfilled for the average resistance to be measured, which average resistance under given circumstances is always known.

To the second class belong those differential galvanometers which are used for testing Telegraph lines, at present the most important application of these instruments. In this case each differential coil should consist of separate coils connected with a commutator in such a manner that it is convenient to alter the resistance of each coil according to circumstances, *i. e.*, connecting all the separate coils in each differential coil parallel, when the resistances to be measured are comparatively low, and all the separate coils consecutively, if the resistances to be measured are high, &c., &c., fulfilling in each case the law of maximum sensitiveness for certain resistances, which are to be determined under different circumstances differently, but always bearing in mind that it is more desirable to fulfil the law of maximum sensitiveness for high resistances, when the testing current in itself is obviously weak, than for the low resistances.

An example will shew this clearer. Say for instance a differential galvanometer has to be constructed for measuring resistances between 1 and 10,000. A Siemen's comparison box of the usual kind  $\left(\frac{1}{10,000}\right)$  being at disposal, it will be convenient and practical to decide that the two differential coils should be of equal magnetic momentum, from which it follows that  $C$  as well as  $p$  must be unity, or in other words that the two coils must be of equal size, shape and distance from the needle, and must also have equal resistances, *i. e.*, must be filled with copper wire of the same diameter. The resistance of each coil is then found by

$$g = -\frac{w+f}{3} + \frac{1}{3} \sqrt{4w^2 + 8fw + f^2}$$

where  $f$  is the resistance of the battery and  $w$  a certain value between

1 and 10,000, the two limits of measurement. The question now remains to determine  $w$ .

It is clear that the law of maximum sensitiveness has not to be fulfilled for either limit, because they represent only one of the 10,000 different resistances which have to be measured, but it is also clear that to fulfil the law for the average of the two given limits would be equally wrong, inasmuch as the maximum sensitiveness is far more required towards the highest than the lowest limit. We may assume, therefore, that it is desirable to fulfil the law for the average of the average and the highest limit, which gives

$$w = 7500$$

against which the resistance of the battery may always be neglected,

Consequently we have

$$g = \frac{w}{3} = 2500$$

for each coil.

Now if the coil be small, and consequently the wire to be used for filling it is thin, the value  $g = 2500$  wants a correction to make allowance for the thickness of the insulating material, by which  $g$  becomes somewhat smaller.\*

Before concluding I may remark that the question of the best resistance of the coil, when the resistance to be measured varies between two fixed or variable limits, can be solved mathematically by the application of the Variation Calculus.

\* These expressions for  $g$  and  $g'$  must be corrected, if the thickness of the insulating covering of the wire cannot be neglected against its diameter. The formula by which this correction can be made was given by me in the *Philosophical Magazine*, January, 1866, namely

$$\text{corrected } g = c g \left( 1 - 4 \sqrt{g m^2} \right)$$

where  $g$  = the resistance to be corrected and expressed in Siemen's Units,

$$\text{and } m = \delta^4 \sqrt{\frac{c \pi \lambda}{AB}}$$

$\delta$  = radial thickness of the insulating covering expressed in millimetres,

$c$  = a co-efficient expressing the arrangement adopted for filling the available space uniformly with wire. Namely, if we suppose that the cross section of the coil, by filling it up with wire, is divided into squares we have  $c = 4$ , if in hexagons  $c = 3.4$ , &c., &c.

$\lambda$  = absolute conductivity of the wire material ( $Hg = 1$  at freezing point).

$A$  = half the section of the coil in question when cut normal to the direction of the convolutions, and always expressed in square millimetres.

$B$  = length of an average convolution in the coil, and expressed in metres.

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ON THE LAND-SHELLS OF PENANG ISLAND, WITH DESCRIPTIONS OF THE
ANIMALS AND ANATOMICAL NOTES ; *part second*,* *HELICACEA*,—
by DR. F. STOLICZKA.

[Read and received 7th August, 1872.]

(With plates I to III.)

In this group of pulmoniferous land-shells I shall notice twenty three species, belonging to the *Zonitidæ*, *Helicidæ*, *Bulimidæ*, *Clausiliidæ*, *Philomycidæ*, *Pupidæ*, *Streptaxidæ*, *Veronicellidæ* and *Vaginulidæ*. The majority of the species are new, except a few previously described from the neighbouring country, and on one or two of such commonly distributed species, as are *Stenogyra gracilis* or *Ennea bicolor*.

Nearly all the species had been collected with the animals living, and I have spared no pains in order to make the detailed anatomical account as complete, as it appears desirable for a correct generic determination.

I scarcely need to mention, that on the whole the fauna is characteristically Malayan, the same fauna which extends from the Philippine islands through Burma and Arakan into the warm valleys of Sikkim. In the plains of Bengal it mixes with the Indian fauna proper.

I cannot help repeating the urgent request to my conchological friends in India, that they may favour me with live specimens of the species of shells occurring in their neighbourhood. In the *Helicaceæ* especially, the anatomical characters are indispensable for a correct generic determination, and without this it will not be possible to obtain a natural arrangement of our terrestrial Mollusca.

Fam. Zonitidæ.

RHYSOTA† *CYMATIUM*, (*Benson*). Pl. i, figs. 1-3 and pl. ii, figs. 13-15.

Helix Cymatium, Benson, apud Pfeiffer, Novit. Conch. I, p. 58, pl. xvii, figs. 1-2.

Penang specimens, which slightly differ in the height of the spire, (see figs. 1-3, pl. i,) agree in almost every point of structure with the type shell, described by Pfeiffer from Lancavi, a small island situated a few miles north of Penang. The increase of the volutions is in both exactly the same, the upper side of the whorls is marked with fine oblique rugosities, the lower is spirally striated; in fresh specimens the former is silky brown, the lower olivaceous brown, the inside of the aperture is in full grown specimens cover-

* Continued from J. A. S. B., for 1872. Vol. XLI, pt. ii, p. 271.

† Albers, *Heliceen*, edit. E. v. Martens, p. 54.

ed with a kind of a nacreous callose layer. The only noticeable difference consists in the narrowness of the umbilicus, its width being in all the Penang specimens, which I obtained, about one twelfth of the diameter of the shell, while in Benson's type it is only one seventh of the same diameter.

The species is found all over Penang hill from elevations of about 300 to 2500 feet, and both on the ground as well as on trees, but chiefly on the latter; it is, however, not common, and adult shells are indeed extreme rarities.

The closely allied *Rh. densa*, (Adams),* only differs by a slightly smaller number of whorls, the last being much wider. *Rh. Chevalieri*, (Souleyet), differs in the same character, though it has the umbilicus of exactly the same size as the Penang variety of *cymatium*.

The animal is stout and rather short, its total length being less than twice the diameter of the shell; the posterior part of the body is the shorter one, and above rather sharply ridged; it ends with a large gland and a projecting horn above it. The whole body is uniform more or less dark brown, laterally strongly warty and obliquely grooved; the pedal row is very distinctly margined on both sides with an impressed line, and the margin of the foot below it is broad, smooth, marked with alternately brown and pale oblique stripes, so as to give the appearance of a variegated fringe. The eye peduncles and tentacles are of usual proportionate length, dark brown or even blackish, the latter with pale tips. On the whole, the general colour of the specimens varies a great deal; the young are mostly pale brown with an olivaceous tinge, while in old ones the neck, including the head and pedicles, become almost black.

The mantle is somewhat paler than the body, its edge moderately thickened. There are two small linguiform shell-lobes present, a right one, just below the inner or posterior angle of the aperture of the shell, thus playing on the inner lip, and producing its moderately distinct nacreous and callose structure. The other lobe lies below the outer periphery of the shell on the basal side; it projects from the outer end of a rather elongated very narrow fringe, which is separated from the edge of the mantle-itself. The right neck-lobe is entire, thick, rounded, somewhat freely projecting at the lower or umbilical end. The left neck lobe is divided in two portions, the upper elongately rounded, the lower much narrower, with the upper end somewhat pointedly extended. The edge of the mantle which secretes the umbilical margin of the peristome is internally considerably thickened, (comp. pl. ii, fig. 13).

I have not been able to see satisfactorily the exact structure of the genital system, but, as far as it could be examined, it appears almost entirely to agree with that of *Rhysota semiglobosa*, figured by Semper. There certainly are no appendages present—neither on the penis, nor on the seminal duct or uterus.

* E. v. Martens, Ost-Asiat. Expedit. p. 230, pl. 10, fig. 1.

The jaw is smooth, semilunar, with a round projection in the middle of the concave edge; it is about 2.5 m.m. broad.

The radula is comparatively of very great length. In a middle-sized specimen it measured 7 m.m. in length and 3 m.m. in breadth, although one of the ends was not quite perfect. I counted 106 transverse rows and about 141 teeth in each row. The centre tooth has a comparatively short point without any lateral denticles, and is somewhat smaller than the adjoining laterals. The first of these has a long, laterally bent, rather blunt projection; the following very gradually decrease in size and the middle cusp becomes gradually more pointed and curved, while the basal plate decreases. With about the fiftieth tooth the end begins to become bicuspid, and on about the hundredth tooth on either side, the two cusps are sharpest and best developed.

Semper (Reisen im Archipel der Philipp., Vol. III, p. 68) says that *Rhysota* does not possess any developed shell lobes of the mantle. In the present species their existence is undeniable, and still all the other characters of the animal and shell point towards the greatest relation of *R. cymatium* to other typical species of the genus, which scarcely would have any meaning, if it were restricted in the sense given to it by Semper. I very much doubt, that all the species with polished lower surface of the shell, referred by Semper to *Rhysota*, have no shell-lobes. How then do they produce the smoothness of the shell? I generally found shell-lobes essential for that purpose. But supposing some of the species really had no shell-lobes, this would be no sufficient reason for excluding any other species which possess them from *Rhysota*; for in *Xesta* we have a similar mixture of forms with and without shell-lobes.

Thus the only anatomical difference, which remains to be considered as distinguishing *Rhysota* from *Xesta*, is the simple form of the genital organs in the former. How far this character is really reliable for generic distinctions, is a point by no means easily settled, as I had already occasion to notice when speaking of the anatomy of the two species of *Sitala* (*Conulema*, olim) (Journ. A. S. B., Vol. xl, Pt. ii, 1871, p. 236 &c.), *S. ategia* and *S. infula*.

When we compare the characters relating to the presence or absence or form of the mantle lobes, we meet with a perfect similarity between *Rhysota* and *Rotula*. The distinction between the two merely rests in the presence of an amatorial gland in the latter genus, while the shells only differ in the upper side of *Rhysota* being irregularly corrugated, and in *Rotula* reticulately striated, or transversely costulated.

In speaking of the shell of *Rhysota*, Albers gives the peculiarly rugose upper surface as one of the most important characters of the genus.

*ROTULA** *BIJUGA*, n. sp., Pl. i, figs. 4-7 and pl. ii, figs. 16-18.

R. depressa conoidea et suborbiculata, vel late conica, angustissime umbilicata, tenui, cornea, pallide succinea; anfractibus 5·5 ad 6·5, suturâ simplici, suprâ rare filiforme marginata, junctis, lente accrescentibus, in superficie superiore convexiusculis, costulis transversis obliquis, confertis, striis spiralibus confertissimis ac plus minusve distinctis intersectis, crispatulis seu subgranulosis, ornatis; ultimo ad peripheriam acute carinato, ad basin modice inflato, nitido, sublævigato, striis incrementi radiantibus atque alteris spiralibus sub-obsolete notato, medio concaviusculo; apertura angulatim semilunari, paulum obliqua, labio tenuissimo vix distinguendo, labro ad marginem tenui, neque expanso, neque incrassato, ad insertionem umbilicalem brevissime reflexo instructa.

Dimensiones varietatum frequentium :—

Diam. major.	D. minor.	Alt. testæ.	Alt. aperturæ.	Lat. aperturæ.
a. 14·5	13·5	11·0	6·0	7·6 m.m.
b. 16·2	15·0	10·9	6·6	8·2 „
c. 17·4	15·6	12·0	7·2	9·2 „
d. 17·4	16·0	10·9	7·0	9·0 „

Diam. maj. speciminis maximi 18·8 m.m.

It will be seen from the above measurements, which are taken from the four figured specimens, that the height of the shell is very variable, but the increase of the whorls is very nearly quite constant. The upper convexity of the whorls also slightly varies; the sides of the spire are generally nearly straight, more rarely conspicuously convex; occasionally the peripheral keel is somewhat projecting above the suture. The ornamentation is characteristically that of *Rotula*, reticulately sculptured above, nearly smooth below. The transverse ribs on the upper surface are traversed by fine spiral lines, which generally only produce a slight undulation in the direction of the ribs, sometimes, however, a fine granulation is formed. As regards form, the present species very closely resembles the Burmese *R. anceps*, (Gould), and also the South Indian *R. Shiplayi*, the first has, however, the upper costulation very fine and no spiral striæ, while the latter has both much stronger developed, producing a granular surface, and the shell is also more solid. The third very closely allied species is *R. indica*, differing principally by a greater width of the last whorl, and also by a stronger sculpture.

* Comp. Journ. A. S. B., 1871, Vol. xl, pt. ii, p. 231. The name *Rotula* has also been applied in the ACTINOZOA, but if our zoological classification should make such rapid progress, as it has done lately, it will, I think, in no long time be almost impossible to find new names for the generic groups, and we shall be forced to modify the existing rules at least so far that the same name may become reapplicable in at least the five or six principal divisions of the animal kingdom. A further relaxation of the rule would scarcely prove beneficial and would hardly be necessary.

The animal of the Penang species, when fully extended, equals in length about twice the longer diameter of the shell ; back roundly flattened above, foot posteriorly obtusely ridged, terminating with a large gland which is superseded by a small horn ; pedal row very distinct and the edge of foot below obliquely striated. The general colour of the body is pale or livid grey, with a general reddish tinge when full grown. A pale yellow (in young), or more or less distinctly cinobor red (in adults), stripe extends along the centre of the back and the superior ridge of the foot, the former is bounded on each side by a broad black stripe, originating at the base of each peduncle and continuing to the mantle, and below this stripe there is again a yellowish or red line. The posterior red band is only edged with black. The sides of the foot, both anteriorly and posteriorly, are more or less distinctly variegated with impure black and tinged with red ; front of head between the two pedicles and tentacles with a black spot ; pedicles and tentacles generally greyish, the latter with a reddish tinge, and with pale, rather large, globular tips, the former with a black ring at the base where the longitudinal black bands begin.

The mantle is moderately thickened. The right shell lobe is entirely obsolete, or only indicated by a very slight extension of the edge, a short distance below the upper angle of the aperture of the shell. Sole of foot divided by a longitudinal groove. The right neck lobe is large and extends as a moderately broad fringe to near the retractor muscle where it terminates with a free end. The left neck lobe is smaller with a linguiform free outer end. The left outer edge of the mantle is externally also entire, like the right one, but about the middle of the basal portion it has internally a distinct lobe, about 2 m.m. in length, which in its situation strictly speaking lies between the shell and the neck lobe ; but as it becomes reflected with its edge over the shell, it has to be regarded as the representant of the left shell lobe. The lower portion of the left neck lobe is only a thickened swelling, extending as a narrow inner rim of the edge of the mantle to near the umbilicus. Both the right and left neck lobe have a large black spot, in continuation of the lateral black bands of the back.

The general anatomy does not differ in any essential point from that of *R. anceps*, as briefly noticed by me in Journ. A. S. B., Vol. xl, pt. II, 1871, p. 233, pl. xvii, fig. 1.

The jaw is semilunar, perfectly smooth, with obtusely rounded corners, and a slight rounded projection in the centre of the concave edge ; it is about 1.5 m.m. broad.

The length of the radula is about 4.5, and its breadth above 1.5 m.m. ; it is composed of about 105 transverse, nearly straight rows of teeth, there being about 121 teeth in each row. The form of the teeth again very closely resembles that of *Rot. anceps*, (loc. cit.). All the points extend beyond the upper edge of the basal plate ; the central is somewhat widened below

the terminal point, contracted in the middle, but it has no distinct denticles at the sides. The laterals gradually become more and more turned, and curved, with a small inner and scarcely a trace of an outer denticle; up to the 20th they very gradually diminish in size, then a very slight break follows, the 21st being somewhat sensibly smaller and first distinctly bicuspid at the tip, while at the same time the size of the basal plate has much diminished, until in the last teeth it almost entirely becomes obsolete; the two terminal cusps on the other hand become gradually more and more equal.

The genital organs have a distinct amatorial gland, possessing near its origin a large globose appendage, internally composed of an elliptical largely cellular mass, in which the cells are concentrically arranged with their longer diameter perpendicular to the walls of the ellipse. The posterior part of the gland is filled with a finely granular substance,—probably calcareous particles. The vas deferens has only one slight enlargement about the middle of its length; it consisted in a simple thickening of the walls, but I could not trace any calcareous particles in it. Towards the end, where the penis is lodged, the tube is widest and somewhat curved, but there are no other appendages, or calcareous sacs accompanied with a flagellum, present, such as have been observed in many other species of *Rotula*.

*SITALA** *CARINIFERA*, n. sp. Pl. i, fig. 8.

Testa globose conoidea, cornea, apice obtusula, angustissime perforata; anfractibus quinque, gradatim accrescentibus, convexe angulatis, sutura simplici junctis, transversim minutissime striolatis, superis infra medium carinis filiformibus duobus ornatis, ultimo ad peripheriam tricarinato, basi planate convexiusculo, lævigato; apertura semilunari, verticali, non descendente, labro extus tenuissimo, in regione columellari paululum reflexiusculo.

Diam. maj. 2·2, minor 2; alt. testæ 2 m. m.

Hab.—‘Penang hill,’ in foliis *Coffea arabicæ*, specimen unicum.

The animal of this species is exactly like that of *S. infula*, figured in pl. xviii, in J. A. S. B., Vol. xl, Pl. ii, for 1871; it has a generally pale brownish grey colour; but having obtained a single specimen, I did not like to sacrifice the shell, in order to notice the internal structure; for when examining these little species one is by no means sure, that he will obtain from a single specimen an insight into the whole anatomy.

The present species is closely allied to the Nilgheri *Helix tricarinata*. Blf., which is also a *Sitala*, and differs by a more depressed and broadly conical shape, and by having a much wider umbilicus.

* H. Adams proposed this name for *Helix infula*, Bens., as type (P. Z. S. for 1865, p. 408). I had unfortunately overlooked this reference, when I proposed for Benson’s *attegaia* (and *infula* and a few others) the name *Conulema*, which must now be regarded as identical with *sitala* (J. A. S. B., xl, pt. II, p. 236.)

*MACROCHLAMYS** *STEPHOIDES*, n. sp. Pl. i, fig. 9, and pl. ii, figs. 19-20.

M. orbiculata, spira depresso convexiuscula, basi medio concaviuscula, angustissime perforata, tenui, succineo cornea, unicolore, circa umbilicum albescente; anfractibus sex, lentissime accrescentibus, sutura lineari junctis, infra suturam angustissime adpressis, nitidis, fere politis, striis incrementi transversis minutissimis, nonnunquam fere omnino obsoletis, notatis, supra convexiusculis; ultimo ad peripheriam fere uniforme convexo; apertura sub-semilunari, vix obliqua, labio per-tenui, labro simplici, ad basin paulum sinuose producto, ad insertionem umbilicalem anguste atque breviter reflexo. Diam. maj. 11·6, d. min. 10·7, alt. 7; alt. apert. cum perist. 4·8, ejusdem lat. 5·6 m.m.

The nearest ally of this species, as regards general character and size, is the Andamanese *Macroch. stephus*,† (Benson), differing from the present species by a somewhat more depressed form and by having the sides of the spire nearly straight or slightly concave, but not convex. *Macroch. hyalina*,‡ Martens, is also very closely allied, it is a larger shell and with a more rapid increase of the volutions, the difference between the smaller and larger diameters being 2·5 m.m. In Burma and Sikkim several other allied forms occur, such as *M. hypoleuca*, *patane*, *petasus*, &c., but they are all smaller and more depressed shells.

The species is rare; I found a single live specimen and half a dozen of old shells at the base of Penang hill, about 300 feet.

The animal is long and very slender, blackish grey above and on the pedicles, paler at the sides of the foot, which has a long and thin horn above the tail gland. Both shell and neck lobes are well developed, the right ones larger than the respective left ones. The two shell lobes are linguiform, and the right one, when fully expanded, covers almost half of the upper surface of the shell. The lower portion of the left neck-lobe is merely represented by a slightly thickened rim, extending from the place of insertion of the left shell-lobe to near the umbilicus.

The jaw is one mill. broad, with a central rounded tooth in the concave edge and with the corners somewhat bent outwardly; a form which is also met with in several other species of *Macrochlamys*.

The radula has not been seen perfect, but it does not appear to have been more than four mill. long, and there appear to have been at least 101 teeth in each transverse row; all with very sharp points; the central with

* Comp. Journ. A. S. B., vol. xl, pt. ii, 1871, p. 246.

† The figure of this species in Conch. Ind., pl. 62, is taken from a young or imperfect specimen, in which the peculiarly depressed form is not so well discernable as in an adult shell. Fig. 6 on the same plate is incorrect, because it does not shew the sinuously produced median basal portion of the peristome.

‡ Preuss. Exped. nach Ost Asien, II, p. 241, pl. 12, fig. 5.

a distinct denticle on either side, and the last laterals with two small unequal cusps; all have the basal plate obtusely narrowed outwardly.

The genital organs are very similar to those of *M. indicus*, Benson, but much more slender; the amatorial gland is very thin (in a young specimen), there is a small caecal appendage on the vas deferens, and a flagellum at the base of the penis, just before a swelling filled with calcareous particles.

*MICROCYSTIS** *PALMICOLA*, n. sp. Pl. i. fig. 10.

M. testa late conica, tenui, cornea, angustissime umbilicata; anfractibus quinque, gradatim accrescentibus, convexiusculis, sutura simplici junctis, supra splendore albide sericino, transversim oblique, minutissime atque confertissime, striolatis, ultimo ad peripheriam acute angulato; basi convexiuscula, olivaceo nitita; apertura subsemilunari, extus angulata, obliqua; labro tenui, simplici, ad basin recedente, ad umbilicum reflexo; labio tenuissimo, vix distinguendo. Speciminis maximi diam. maj. 2·8, d. minor 2·6, alt. 2·2, diam. apert. 1·7, ejusd. alt. 0·95 m.m.

Hab.—Penang, sub corticem *Cocos nucifera*, haud frequens.

The shell is distinguished from allied species by its comparatively sharply angular last whorl, slightly inflated base and by the peculiar silky and very finely striated upper surface.

The animal when fully extended equals in length about four diameters of the shell; it is rather dark brownish grey, darkest on the tentacles and on the rostrum; posterior gland superseded by a small horn.

HELICARION† *PERMOLLE*, n. sp. Pl. i, fig. 11 and pl. ii, figs. 21-23.

H. testa depresso inflatæque conoidea, tenuissima, fere membranacea, translucente, pallide lutescente, vix perforata, spira ultimo anfractu multo brevior; anfractibus 4·5, rapide accrescentibus, ad suturam simplicem adpressis, nitidis, convexiusculis, ultimo inflato, ad peripheriam rotundato, transversim lente arcuateque striatulo, ad basin striis spiralibus sub-obsoletis notato; apertura lunari, valde obliqua, labio albescente, minutissime puncticulato, labro tenuissimo, simplici, ad basin valde recedente, ad marginem interiorem umbilici breviter reflexiusculo. Diam. maj. 8·4, d. min. 7·4, alt. 6·3; alt. apert. cum perist. 4, ejusd. lat. 4·3 m.m.

The rather strongly elevated spire, and the membranaceous and transparent structure of the shell, separate this species from the numerous allied forms of the Philippines. The species is rare; I only obtained about half a dozen specimens on low bushes or between old vegetable matter on the ground, about 500 feet above the sea, on Penang hill.

* *Microcystis*, Beck. Comp. Semper in Reis. Arch. Philipp., pt. II, vol. iii, 1870, p. 43, and Stoliczka in J. A. S. B., vol. xl, pt. II, p. 251.

† Semper, Reisen Archip. der Philippinen, vol. iii, p. 20.

The animal is slender and very long; when fresh the extended foot is three times the longer diameter of the shell, which is then entirely covered by the mantle; but in captivity the shell lobes shrink very rapidly, being reduced to narrow linguiform appendages. Middle of back and of the hind foot whitish or very pale brownish, with a slight pinkish tinge; a broad blackish band runs from each pedicle along the sides of the whole back, and also on the sides of the posterior part of the foot, as far as the terminal gland, which is superseded by a very distinct pointed horn; the dark colour extends down to the pedal row, while a large black spot about the middle of the foot on each side reaches down to the sole; pedicles long, grey; tentacles short and almost white; mantle blackish with small whitish dots. All the four mantle lobes are well developed, the left shell and neck lobes are proportionately somewhat larger than the corresponding right ones, and each of the former has a deep but narrow incision in its lower portion.

The jaw is about one mill. broad, quadrant shaped, smooth, without any projection in the centre of the concave edge, like in most other species of the genus.

The radula is moderately broad and nearly 2.5 m.m. long; there are 95 transverse rows and about 121 teeth in each row, all remarkably small and from the tenth tooth they somewhat rapidly decrease in size towards the edges. The centre tooth has two distinct denticles on either side and a third much smaller one nearer to the base; the principal cusp is pointed. On the subsequent teeth the inner denticles disappear first, and gradually altogether, then the lower outer, while the upper outer remains, until at last it equals the principal cusp, so that the outermost teeth become almost regularly, though shortly, bicuspid.

The general anatomy does not offer any peculiarity requiring special notice. The nervous and digestive apparatus agrees with that of other ZONITIDÆ, except perhaps that the liver is enormously largely developed. The female portion of the genital system has a long sub-pedunculate receptaculum seminis, branching off at its origin. The vas deferens is very short, passing into a rather widened tube, again somewhat contracted near the base of the penis, which is attached by a special strong muscle. The end of the penis widens very rapidly for a short distance before it joins the hermaphrodite opening. I have not observed, in two specimens examined, any coecal or calciferous appendages.

Genus. *TROCHOMORPHA*, *Albers.*

HELICEN, Edit. E. v. Martens, p. 60, and Preussische Exped nach Ost Asien vol. ii, Landschnecken, 1867, p. 245; *Nigritella* and *Videna*, ibidem. *Sivella*, Blauf.

The type of this genus is *Helix trochiformis*, Fér., which is characterised by a moderately solid, sub-discoid or depressedly conical shell, the whorls being flattened above, the last carinate at the periphery, the aperture rhombiform or narrowly semilunar with simple sharp edges, but the columellar lips occasionally internally somewhat thickened and slightly reflexed.

I do not know whether the animal of this typical species had been examined, but I have observed those of about a dozen different species, which evidently belong to the same type, and I find that all of them possess a very fine glandular slit at the upper end of the foot, the pedal row being in all also distinct; they have, therefore, to be referred to the ZONITIDÆ, as already noticed in my paper on the Moulmain shells in Jour. A. S. B., vol. xl, pt. II, 1871, p. 225.

Judging from a somewhat more intimate examination of the animals of a few species, the following characters have to be added to those derived from the peculiar shape of the shell.

Animal moderately slender, with the posterior part of the foot shorter than the anterior, the former terminating above with a small glandular slit; pedal row distinct; mantle with elongated narrow neck lobes, but with the shell lobes entirely wanting, left neck lobe sometimes divided or insinuated in the middle; jaw smooth; genital organs without amatorial gland, or any other appendages; seminal receptacle and seminal duct very long.

The *Trochomorpha* live on the ground generally in decaying vegetable matter, under or on old wood. Three species have been found on Penang.

Albers, while noticing several typical species, such as *T. planorbis*, Less., under his genus *Discus*, referred to *Trochomorpha* a most varied mixture of shells: for instance; *anceps*, Gould, *serrula*, Bens. etc. which belong to *Rotula*; *Barrackpoorensis*, Pfr., is a *Kaliella*; *cacuminifera* and *infula*, Bens. are *Sitalæ* (= *Conulema*, olim); *H. capitum*, Bens., does not belong to the present family, but to the next, the true *Helicidae*, etc.

E. v. Martens (l. cit. pp. 246 and 247) adopted two groups in the genus *Trochomorpha*; the one, for which he proposes the name *Nigritella*, includes the obtusely conoid and more solid shells, sometimes with a somewhat obtuse periphery; these are true *Trochomorpha*, of the type of *H. trochiformis*, or of *Troch. Ternatana*, Guillou; the name *Nigritella* is, therefore, entirely superfluous. The second group is classed by Martens as *Videna*, Adams; it includes the more planorboid and sharply keeled species of the type of *H. planorbis*, Less. For this same group, (type *H. castra*, Benson,) W. T. Blanford proposed the subgeneric name *Sivella*.

Judging from the similarity of the shells of these two groups and from what we know of the animal of *T. Ternatana*, observed by Martens, I very much doubt that any necessity exists for subdividing the genus *Trochomorpha*.

TROCHOMORPHA CASTRA, (*Benson*). Pl. i, figs. 14-16 and pl. ii, figs. 7-9.

Helix castra, Benson, Ann. and Mag. Nat. Hist., 1852, vol. x, p. 349.—Reeve, Conch. Icon., *Helix*, No. 1160.

The shell is subject to a very considerable amount of variation as regards the elevation of the spire. Young specimens are sometimes almost planorbular, and in some adults the total height of the shell is scarcely more than one-third of the larger diameter, while in others it somewhat exceeds one half of the same dimension. The width of the umbilicus varies from 0.2 to 0.3 of the diameter of the shell. The base is always distinctly spirally striated, but on the upper side the oblique transverse striae of growth prevail. The usual colour is pale horny, sometimes brown with a pale band below the suture.

The species is very rare on Penang hill, but it is common in Pegu, Arakan, Assam, Sikkim, and within the last few years it became abundant in the botanic garden near Calcutta, having been most likely introduced from Darjeeling. One of the largest Sikkim specimens in my collection measures: larger diam. 13, smaller diam. 12, height of shell 7, same of apert. 3, width of same 5.4 m.m.

The animal changes from dark leaden to blackish grey, being always paler at the sides of the foot, generally tinged with brownish below the pedal row; tentacles and pedicles mostly somewhat darker than the body; neck distinctly warty; sole dark grey, entire, without any distinct furrows; tail gland represented by a fine slit about one mill. long. The total length of the foot generally equals one and a half diameters of the shell, the caudal portion being always shorter than the anterior one. The mantle is blackish and in its extent above the large pulmonary cavity variegated with pale spots.

The jaw is smooth, very thin, almost semicircular, with broad oblique ends and a small, in younger specimens sometimes almost obsolete, projection in the centre of the concave edge; its width is about one half millimetre.

The radula is narrow, about two mill. long, or slightly longer, composed of about 85 transverse straight rows, there being about 101 teeth in each of them. All have very sharp, long and pointed cusps, the central with a small denticle on either side near the tip; on the outer ones, as they turn laterally and gradually decrease in size, the inner denticle disappears, while the outer increases, until on the last 15 or 20 teeth, preceding the 3 or 4 terminal ones, it equals the principal cusp. The last few teeth are short, broad, and their outer cusp becomes almost entirely obsolete, the teeth presenting merely an oblique sharp edge.

The female portion of the genital organs has a globular swelling near its origin at the hermaphrodite opening, and the receptaculum seminis

branches off above this gland, it is fully one inch long, somewhat thickened in the middle. The penis is attached by a short muscle, about 4 m.m. long and moderately thickened.

TROCHOMORPHA CANTORIANA, (*Benson*). Pl. i, fig. 13.

Helix Cantoriana, Benson, Ann. and Mag. Nat. Hist., 1861, vii, p. 85.

Five specimens which I found on Penang hill (at about 2000 feet elevation) exactly correspond with Benson's description, which was taken from a solitary specimen obtained by Dr. Cantor on the small island Sung-Sung near Penang. The illustration given on plate i will dispense with a repetition of the description quoted above. The apex is smooth, slightly swollen, and there are scarcely more than five whorls in specimens of 10 m.m.

The animal is blackish grey with a very narrow, pale dorsal stripe, quite similar to that of *T. castra*, but by some accident no specimen was preserved in spirit, so I cannot give any further details of its structure; it is, however, certainly a *Trochomorpha*. The specimens were found under a log of old wood.

TROCHOMORPHA TIMORENSIS, Martens. Pl. i, fig. 17, and pl. ii, figs. 10-12.

E. v. Martens, in Preuss. Ost-Asiat. Exped., 1867, II, p. 248.

Penang specimens, of which I obtained sixteen, entirely agree in form and structure with the shell described by E. von Martens, with the single exception that the last whorl is not descending near the aperture, but there is an inclination to it, as its terminal portion in adult specimens is slightly more bent downwards than the preceding part (comp. figs. 17*a* and 17*b*). This character is, however, certainly a variable one; it does also occasionally occur in adult specimens of *T. castra* and *T. planorbis*. The differences noticed by E. v. Martens regarding the greater number of whorls, and the larger umbilicus, with less rapidly descending sides, in *Timorensis*, when compared with *planorbis*, are well marked in Penang examples.

The species is found sparingly on or under old wood all over Penang hill; *T. planorbis* was not met with there, but it is a very abundant shell at the Nicobars.

The animal is uniform blackish, mantle more intense black; pedal row distinct and the edge of the foot below it nearly quite smooth; neck and sides covered with small warts; tail gland represented by a very fine slit, scarcely more than half a millimetre long.

The jaw and radula are quite similar to those of *T. castra*. The former is about three quarters mill. broad, with somewhat curved out ends and a broadly rounded central projection in the concave edge. The teeth are very slender, and the lateral denticles are very close to the tip on the centre tooth. The outer denticle descends a little lower down on the laterals, but it

always appears to remain smaller than on the corresponding teeth of *T. castra*; the outermost laterals were not observed, they must be very thin.

The genital organs are distinguished by a very great length of the seminal receptacle and of the seminal duct; the former is one and a half to nearly two inches long; it is somewhat widened near its origin but further on almost throughout equally thin.

Fam. Vitrinidæ.

VITRINA NUCLEATA, n. sp. Pl. i, fig. 12 and pl. ii, figs. 4-6.

Vit. testa depresso ovata, tumidula, tenui, pallide cornea, translucente; anfractibus 3·75, nucleo 1·5 anf. composito, late conico, inflato, lævigato, duobus anf. sequentibus ad suturam adpressis, subcanaliculatis, rapide accrescentibus, nitidis, transversim striis incrementi minutissimis notatis; apertura ampla, per-obliqua, labio undique tenuissimo, ad basin valde recedente, margine supero convexiusculo. Diam. maj. 9, diam. minor 7, alt. test. 5·3, alt. aperturæ 4·8, ejusdem latitudo 6·1 m.m.

A characteristically distinct species, by having the nucleus composed of one and a half whorls, conically tumid, while the next whorl is at its beginning only very narrowly exposed, or almost entirely covered. The outer lip is very thin, almost membranaceous, and simple throughout.

V. nucleata is one of the rarest Penang shells. I found three live specimens on the Penang hill in dense forest on old wood, about 1000 feet above the sea, and two more old shells at the base of the hill.

The animal is entirely black, only slightly paler at the front sides of the foot; it is very long and slender, its total length being about four times that of the longer diameter of the shell; the anterior part is the much shorter one, the posterior tapers into a point, and the whole is warty and grooved. The mantle, however, is nearly smooth. In quite fresh specimens the two shell lobes entirely cover the shell, but generally the left lobe covers a little more than one fourth of the last whorl extending from the margin of the mouth, while the right lobe also covers one-fourth of it beginning at the angle of the mouth, but at the same time also envelopes the whole spire. The neck lobes are also well developed, rounded, with simple edges, the left is much larger and longer than the right one. The sole of foot is pale brown, divided by two grooves in nearly three equal parts, of which the median is smooth and the lateral transversely sulcated. Pedal row well marked by a thin groove above and along the entire base of foot.

The jaw is semilunar, radiately finely striated, with a blunt projection in the centre of the concave edge; the outer or convex portion is smooth; it measures about 0·75 m.m. in breadth.

The radula is about two mill. long and half a mill. broad; there are 110 transverse, almost quite straight rows, but only 61 teeth in each of them.

All have very sharply pointed cusps, the central has two small lateral denticles on either side; on the outer ones these denticles almost entirely disappear.

The genital organs are distinguished by a great length of the uterus, at the end of which lies a large albuminous (*ag.*) and hermaphrodite gland (*hg.*). The seminal receptacle (*rs.*) is a long, pedunculated, spacious bag which includes a peculiarly twisted, horny organ, provided on the concave side with short crispate appendage. It is the same problematic organ which I described in *Sesara infrendens*, Gld., and *Macrochlamys* [*Durgella*] *honesta*, Gld., (Comp. J. A. S. B. XL., Pt. II, p. 242 and 250, pl. xvi, fig. 5 and 6, and pl. xvii, fig. 13). Whether this structure represents the amatorial organ and whether that which we call a seminal receptacle really possesses the function which we attribute to it, appears to be as yet an open question. In the present species I found the terminal end of the so-called seminal receptacle filled with a milky substance, which under a high power exhibited a quite irregular flaky appearance.

In other respects the present species does not offer any anatomical peculiarities. The œsophagus is comparatively thin, long, cylindrical. The kidney, situated near the end of the rectum, is very large, of a broadly triangular shape; the liver enormously developed.

Some years passed the *Vitrinæ* had been classed as a subfamily of the *Helicidæ*; more recently they had been by various authors treated with the *Zonitidæ*, in the Oxygnathe group of HELICACEA. I think the older classification is preferable, as entered by Binney and Bland in their Land and Fresh-water shells of N. America. But I would prefer to give them, together with *Helicolimax*, *Hyalina* and their allies, a position intermediate between the two families. They combine indeed several of the characters of both. Although they do not possess a terminal mucous gland on the end of the foot (as all *Zonitidæ* do), they have a more or less distinct pedal row, and the sole appears to be often divided by longitudinal grooves. The jaw is entirely or partially finely transversely striated, not quite smooth, as usually in *Zonitidæ*, and not ribbed, as in true *Helicidæ*. However, the teeth, particularly the outermost laterals, have more the pointed character of the former than of the next family.

Fam. Helicidæ.

TRACHIA* PENANGENSIS, n. sp. Pl. iii, figs. 1 and 18-20.

T. suborbiculata, alta, spira breviter elevata, obtusa, modice sed profunde umbilicata, tenui, fere cornea, cuticula luteo-fusca dense et breviter pilosa induta, unicolore; anfractibus 4·5, convexis, sutura profunde subcanaliculata junctis, ultimo ad peripheriam uniforme convexo, ad aperturam paulo descen-

* Compare, Stoliczka in Journ. A. S. B., vol. xl, Pt. II, 1871, p. 223.

dente, ad marginem umbilici obtuse angulato; apertura semilunari, labio tenui, labro expanso atque reflexo, ad insertionem umbilicalem paululum dilatato, ad basin indistincte subangulato, pallide violaceo tincto. Diam. maj. 16, diam. min. 14·5, lat. apertura cum perist. 8·8, ejusd. alt. 8·2 m. m.

As regards the thin, almost horny, fulvous, thickly and finely setose structure of the shell, this species is probably most closely allied to *T. erinacea*, Pfr., but it differs from it, as well as from two other very similar forms, *T. qujeta*, Reeve, and *T. eustoma*, Pfr., by its conspicuously more elevated spire. Other species of similar type, like *T. breviseta*, Pfr., from Siam, *T. Helfereri*, Bens., from the Andamans, and four or five others described by Pfeiffer and E. v. Martens have nearly all a more depressed form and mostly sub-angular last whorl, although their spire is somewhat elevated.

The animal is dark chocolate brown, with a very narrow pale dorsal and caudal stripe, the body is laterally somewhat more blackish in front, and tinged brownish behind; the posterior end of the foot is the shorter one, as in *Trochomorpha*, although not to the same extent.

The jaw is quadrant shaped, with about six strong ribs,* and one or two less distinct ones on either side; it is 1·3 m.m. broad.

The radula is about 2·5 m.m. long., and 1. m.m. broad; there are 95 transverse rows, and 91 teeth in each of them, decreasing in size the more they approach the edges. The centre tooth is slightly smaller than the first laterals. All have a large basal plate, which is on the centre tooth slightly emarginate in the middle of the upper edge; this emargination increases in depth on the laterals, the inner branch remaining smaller, until on the last ones the upper edge becomes represented by two obtuse branches. The hook is on all teeth comparatively small, broad, with a moderately sharp point. On about the tenth tooth a small denticle appears to shew on the outer edge near the tip, becoming more distinct on the following teeth. After the eighteenth lateral, the teeth become somewhat more rapidly shorter, but increase in width until the last are wider than long, or high, and on these the basal plate has almost entirely become obsolete.

The genital organs are more than an inch long. The female portion has a long seminal receptacle, strongly thickened and muscular for some distance from its origin, then passing into a long thin tube and terminating with a moderately enlarged bubble, attached by very thin muscular fibres to the albuminous gland which is situated at the end of the uterus. The vas deferens takes its origin near the upper end of the uterus; it is attached by numerous thin threads at the hermaphrodite opening, and after a short distance enlarges into a muscular tube. At the beginning of this enlargement is a short pointed flagellum (*f*), and at the

* Evidently very much like that of *Campylaea*.

other end, where the penis begins, is a retractor muscle. The penis itself has near its base a cœcal appendage; its terminal portion, before it joins the hermaphrodite opening, is very thin.

A comparison of the genital organs with those of *Trachia delibrata*, represented in J. A. S. B., vol. XL, Pt. II, 1871, pl. xvi, fig. 1, will shew, that the only essential difference consists in the presence of the small cœcal appendage on the penis in *T. Penangensis*. The jaw has fewer and less strong ribs, than that of the former species, but the teeth themselves are extremely similar.

Taking all these anatomical characters together with those of the shell, as noticed in my paper cited above, I think we can consider *Trachia* as a fairly established genus of the HELICIDÆ.

HELIX [FRUTICICOLA] SIMILARIS, Fér. Pl. ii, figs. 1-3.

Comp. E. v. Martens in Preuss. Exped. nach Ost-Asien, vol. II, pp. 43 and 270, etc. Stoliczka in J. A. S. B. vol. XL, Pt. II, 1871, p. 224.

On Penang this species is mostly found in the coco-palm plantations up to a height of about 200 feet, never in the interior of large forests and at great elevations. The shells are of the usual small size (larger diam. between 12 and 13 m.m.), with or without a brown peripheral band. The striæ of growth are generally fine, but in some specimens they accumulate to strong ribs which give the shell a very peculiar costate appearance.

I also obtained the species from Malacca, near Singapore, Hongkong, Chusan, Maccao, Canton, &c., northwards it extends through Tenasserim into Burma, where it is associated with a great number of closely allied species, some of which may prove to be mere varieties of it. I may mention *H. boiuss*, *H. scalpturrita*, *H. Zoroaster*, &c.

In Bengal itself the species is not known, but in Central India it is represented by *H. propinqua*, and on the Andamans by *H. hemiopta*. Judging from the great number of closely allied species in the Indo-Malayan region, there is certainly the greatest probability that the original habitat of *H. similis* falls within the Indo-Malayan Archipelago, and that it has been introduced into Mauritius, China and South America.

The animal is rather slender, all over strongly warty, brownish fleshy white, or pale brown, the pedal row is very slightly indicated by a fine groove; the pedicles and tentacles are greyish white, mantle dull milky white with a slight vermilion tinge. When the animal is quite fresh the total length of the foot is equal to from two and a half to three longer diameters of the shell.

The jaw is semilunar, about 1 m.m. broad, with three strong central ribs, followed by a somewhat broader one on either side, while the next is only indicated by a faint dark line.

The radula is when compared with the size of the animal large, about 2·3 m.m. long, and somewhat more than one m.m. broad; it is composed of about 90 transverse rows, with 67 teeth in each of them. The central is much smaller than the adjoining laterals, with a long arched cusp. The laterals somewhat rapidly decrease in size after the 14th; on the outermost the basal plate gradually disappears, while the breadth of the teeth exceeds their length.

The genital organs are more complicated than in *Trachia*. The female portion has at its origin a rather short, thick muscular cœcal appendage, which most probably represents the amatorial gland; it is widened near its origin and at its rounded end. The seminal receptacle is a round bag, attached to a long thin peduncle of about the same length as the uterus. The seminal duct is moderately long, but the penis comparatively thick and attached by a strong muscle.

Fam. Bulimidæ.

BULIMUS.—Subg. *Amphidromus*.

The only two species which I found among the coco-palms were *Bulimus atricallosus*, Gould, and *B. interruptus*, var. *citrinus*; the uniform coloured greenish yellow variety. The former is the more common species.

Besides these two, the ubiquitous *Stenogyra gracilis* is by no means rare at the roots of palm trees.

Fam. Clausiliidæ.

CLAUSILIA (PHÆDUSA) PENANGENSIS, n. sp. Pl. ii, figs. 4-6 and 15-17.

C. testa fusiformi, plus minusve attenuata, medio ad anfractum penultimum latissima, non rimata, solidula, castanea, apice submammillata, albescens, anfractibus 9·5 ad 10·5, convexis, sutura simplici junctis, transversim confertissime striolatis, penultimo sensim attenuato; apertura ovata, intus castanea, peristomate modice expanso, undique libero, albescens, plica supera crassa, ad marginem aperturæ continua, columellari immersa, tenui, valde oblique intrante; plicis palatalibus six, prima longissimima, unam mill. a margine suturali distante, ceteris multo brevioribus, subæqualibus, modice curvatis atque fere æquidistantibus.

Var. brevis, exquisite fusiformis, vide fig. 6 et 6a; long. 24, lat. 6·2, apert. cum perist. 6 longa, 4·5 m.m. lata.

Var. elongate fusiformis, vide fig. 5; long. 26·3, lat. 6·2, apert. 6·9 longa, 4·7 m.m. lata; in hoc specimine apertura exceptionaliter longa est, in speciminibus alteris, forma similibus, longitudo aperturæ 6·2 ad 6·4 observanda.

Var. *exilis*, attenuate fusiformis, vide fig. 4 et 4a; long. 27, lat. 6, long. apert. 6·3, lat. 4·6 m.m.

Hab.—Penang hill, frequens.

This is an extremely variable species as regards the shorter or longer fusiform shape of the shell, and also as regards the size of the aperture, but both these variations are very commonly observed in other species of the genus, and particularly in the allied Malayan species *Cl. Gouldiana*, Pfr., *insignis*, Gould,* and *Sumatrana*, Martens.† All three have a similarly variable shape, and finely striated, moderately convex, whorls, but in the two former the aperture is much shorter of a squarish shape, and in the last it is conspicuously longer; E. v. Martens gives its length at 8 m. m. in a specimen, the total length of which is from 23·5 to 31·5 m. m. In this last species, which also comes nearest to the Penang shell, the whorls appear to be slightly less convex and there are only five palatal plates present.

The animal is uniform grey covered with small pale brown warts, darker on the back, paler on the pedicles, which have very small, black eyes; tentacles very short.

The general anatomical structure agrees with that which I published of *Cl. Philippiana*, (comp. J. A. S. B., vol. xl, pt. II, 1871, p. 174, pl. vi, fig. 8).

The genital organs are distinguished by a very great length of both the uterus and the penis, both of which are much twisted. The only appendage is that of the seminal receptacle, which is comparatively small and narrow, situated at the end of a long peduncle.

The jaw is very short, about 0·5 m. m. broad, apparently smooth; only very faint radiating and concentric lines are to be observed in certain lights.

The radula is about 2 m.m. long and 0·5 m.m. broad; it consists of about 125 rows, with 61 teeth in each row. All are provided with a strongly curved cusp; after about the fifteenth tooth, they rather rapidly decrease in length. Towards the end of each row they become multi-serrated, while the basal plate almost entirely disappears. The last teeth are very short, but broad, almost linear and entire.

CLAUSILIA [PHÆDUSA] FILICOSTATA, n. sp. Pl. III, figs. 7-8.

Cl. testa fusiforme turrata, apice sensim attenuata, subrimata, tenui, pallide cornea; anfractibus 10 ad 11, lente convexiusculis, sutura simplici junctis, ad suturam filiforme marginatis atque infra marginem paulum contractis, transversim oblique dense costellatis, antepenultimo vix latiore quam penultimo, ultimo versus aperturam paululum contracto; apertura ovate subtrigona, postice, (aut supra), subangulata, peristomate expanso, undique libero, plica

* J. A. S. B., xli, pt. II, pp. 203, 204, 208, pl. ix.

† Ost-Asiat. Exped., 1867, p. 379, pl. 22, fig. 17.

supera tenui, haud usque ad marginem peristomatis interni extensa, intus in fauce rapide evanescente, columellari approximata, fortiori, valde obliqua; plicis palatalibus circiter decem, supera longissima, a margine distante, duabus vel tribus sequentibus multo brevioribus, cæteris brevissimis, omnibus inter se irregulariter dispositis. Long. 21·2, lat. 4·4; long. apert. cum perist. paulo imperfecto 4·8, lat. 3·6 m.m.; specim. secundi apert. cum perist. perfecto 5·3 longa et 4 m.m. lata.

Hab.—Penang hill, cum precedente, sed rarissima.

This species is very closely allied to *Cl. Javana*, Pfr., but the latter has the whorls, particularly the middle ones, somewhat higher, the transverse costulation is a little finer, and more crowded, the palatal plaits are fewer, two according to Küster, three to four according to E. v. Martens; it also appears to have the two labial plaits stronger. I do not know any other species with which the Penang shell can be compared. It appears to be extremely rare; out of three specimens found only one has the aperture with the margins perfectly well developed.

Fam. Philomycidæ.

Binney and Bland, Land and fresh-water shells N. America, pt. I, 1869, p. 294.

Genus. *PHILOMYCUS.*

1820. Rafinesque. Comp. 'Complete writings,' by Binney and Tryon, 1864, p. 64.

1821. Férussac, Tabl. syst. des Limaces, p. 14.

1823. *Meghimatium*, Hasselt, Algem. Konst. &c., p. 232; *idem*, Fér., 1824.

1842 (August). *Incillaria*, Benson, Ann. and Mag. Nat. Hist. vol. ix, p. 486.

1842 (Septb.). *Tebenophorus*, Binney, Boston Journal, iv, p. 171, and 1844, Wyman, *ibidem* p. 410.

1866. *Philomycus*, (anatomy of) Keferstein, Zeitsch. Wissensch. Zool., vol. xvi, p. 183.

1866. *Incillaria* and *Meghimatium* (anatomy of), Keferstein, Malacoz. Blätter, vol. xiii, p. 64.

1869. *Tebenophorus*, Binney and Bland, Land and Fresh water shells N. Am. pt. I, Pulm. Geoph., p. 295.

Philomycus apud H. and A. Adams, Chenu, E. v. Martens &c.

It must be admitted that the original characteristic of the genus by Rafinesque is a very unsatisfactory one, but that is the case with many other old definitions. When Rafinesque wrote that *Philomycus* has no visible mantle, everybody* could, I think, fancy that the mantle must extend over

* Binney writes in 1841 (Boston Journ. IV, p. 174) of his *Philomycus dorsalis* corpore.....clypeo nullo,' and on p. 171 of *Tebenophorus carolinensis* 'clypeo lato et elongato, dorsum integrum vestiente,' and still both species have the mantle covering the entire upper surface of the body, and both are *Philomycus* (or *Pallifera* of Morse).

the whole body, if the animal can at all be closely compared with *Limax*, or else it could not be a Mollusc at all. This was indeed well understood by Férussac, who in the next year referred to *Philomycus*, besides the four insufficiently described species of Rafinesque, *Limax carolinensis* of Bosc, well known from description and figure, (copied in Hist. nat. des Moll., pl., 6, fig. 3). And as Rafinesque's species had not been rediscovered and his descriptions not made more complete, *Ph. carolinensis* remained to be considered as the type of the genus, though I do not think that there can be much doubt on the point, that Férussac had correctly interpreted Rafinesque's meaning. In any case there was no sufficient ground for introducing the name *Tebenophorus* for the same species.

Keferstein (loc. cit.) has shewn by the anatomical examination of the three typical species, *Philomycus carolinensis*, (seu *Tebenophorus*), *Meghimatium striatum* and *Incillaria bilineata*, that all three genera have to be united into one. The general anatomy and dentition &c., agree in all, the only traceable distinction of *Phil. carolinensis* consists in the presence of a small amatorial organ, situated at the entrance of the seminal receptacle. The presence or absence of this organ, or even of that of a special amatorial gland (see ante, p. 13), is rightly considered by Keferstein as insufficient for a generic separation of the American from the Indian species. I had repeatedly opportunity of satisfying myself of this by the observation, that the development of that organ does not only appear to depend upon the age of the animal, but often even upon the season or peculiarities of the conditions, under which the animal lives. As far as our materials enable us to judge, we can, I think, look upon *Philomycus* as a well established genus. For the present it has to be regarded as the sole representative of the family. The finely radiately striated (in *Ph. dorsalis* coarsely ribbed) jaw in part resembles that of the VITRINIDÆ, but the dentition has decidedly more the character of true HELICIDÆ.

I have to notice one new species found on Penang.

PHILOMYCUS PICTUS, n. sp. Pl. III, figs. 9-14.

Ph. corpore tenuiter cylindraceo, plus minusve (35 ad 46 m.m.) extenso, antice rotundate subtruncato, postice acuminato, livido, copiose mucoso, suprâ pallio lævigato, lateraliter atque in parte postica nonnunquam subgranuloso tecto, fasciis tribus longitudinalibus atratis, reticulationibus ejusdem coloris junctis, picto, faciâ centrali latissimâ, duabus alteris tenuioribus ad latus dorsi sitis et a margine inferiore distantibus; orificio pulmonari antice ad latus dextrum in incisione pallii sito, circiter 5 ad 7 m.m. a terminatione antica distante; pedunculis oculiferis circ. 5 m.m. longis, tentaculis brevissimis, ambobus pallidissimis; pede infrâ transversim plicatello, livido.

During life the length and comparative thickness of the animal changes very rapidly, as may be noticed from a comparison of the two sketches taken from life and one from a specimen preserved in spirit. The animal is covered by a thick layer of mucous secretion, it is very active, and readily burrows in light decomposing vegetable substance. The three black longitudinal bands are connected by a similarly coloured net work which continues, interspersed with, or dissolved into, little dots, to the lower edge of the mantle. The three distinctly marked bands distinguish the present species from the Javaen *Ph. reticulatus*, according to Férussac's figures 2* and 3 on pl. 8 E., p. 96^s, Moll. terr. et fluv. vol. ii. The peduncles are about 5 m.m. long, provided with distinctly developed globules on which the small black eyes are situated; the tentacles are very short, and when the animal moves about scarcely noticeable; both are very pale coloured.

The anatomy of the species almost perfectly agrees with that given by Keferstein of *Ph. striatus* and *bilineatus*. The internal pulmonary cavity extends to about one anterior fourth of the length of the body, and in the fresh animal is always well marked by the mantle above it being somewhat inflated. On this inflated portion, the mantle is smooth, on the other parts generally slightly rugose.

The genital organs (comp. fig. 13) have no special amatorial gland. The seminal receptacle is a globular pedunculated bag, situated a short distance from the hermaphrodite opening. In two specimens which I examined, I noticed the development of a strongly fibrous bundle of muscles at the entrance of the receptacle, where it branches off from the oviduct, but there was no special amatorial organ present.

The jaw is semilunar, strongly curved, thin, radiately striated; when laid flat about one mill. broad.

The radula is 2.8 m.m. long, only about 0.5 broad; there are about 170 rows, and 87 teeth in each row: the central tooth with a symmetrical simple curved cusp, the laterals with a more oblique but simple cusp, both it and the basal plate gradually decrease in height until the last teeth become almost linear and form a confluent row.

None of the other organs require any special notice.

I found three specimens of this species among old decaying vegetable matter on the ground at the northern base of Penang hill, about one hundred feet above the sea.

* E. v. Martens (Preuss. Exp. nach Ost-Asien, Landschnecksn, p. 182) refers to this figure as a synonym of Hasselt's *Parmacella reticulata*, which he quotes as *Parmarion reticulatus*. I do not know Hasselt's original figure, but surely the one given by Férussac does not represent a *Parmacella* or a *Parmarion*.

Fam. Pupidæ.

This family is represented in India and Burma by *Hypselostoma*, *Boysia* and various subgenera of *Pupa*, all of small size. Among the *Pupæ* found in Burma and the adjacent countries, inhabited by a large number of Malayan forms, the majority are referable to Albers' subgenus *Scopelophila*, the type of which is *Pupa Kokeilii*, Rossm. The shells are small, subconic or subcylindrical, composed of 4 to 8 whorls, with a moderately thin, semicorneous or corneous texture, covered by a brown cuticle; the last whorl is rimate at the base, always somewhat rapidly turned to the front, generally slightly ascending at the aperture, which is internally instructed with teeth on the whole peristome; commonly there is a bifid tooth on the inner lip, it is larger than any of the others. Some of the species appear to differ from *Pupilla* merely by the peculiar turn of the last whorl towards the front, thus shewing a strong affinity to *Hypselostoma*. The Indian species of *Scopelophila*, as far as I observed them, have the pedicles well developed and the tentacles short.

A second small group of *Pupa*, which is found in India, Burma and the country southward, is characterised by a subconic or ovate shape, composed of three to five whorls, of a thin corneous texture, covered with a transversely striated cuticle; the last whorl is not ascending, the aperture generally edentulous; the columellar lip is externally near its attachment somewhat expanded, mostly covering the umbilical region, while internally at the base it is twisted and occasionally provided with a small tooth. I propose for this subgeneric group the name

Pupisoma,

and regard as the type of it the Moulmein *P. lignicola*, described in J. A. S. B., vol. xl, pt. ii, p. 171, pl. vii, fig. 3. The animals have very short pedicles and barely a trace of tentacles. They generally live on wood.

PUPA [SCOPELOPHILA] PALMIRA, n. sp. Pl. II. fig. 3.

P. testa ovate cylindracea, rimata, sordide albida, cornea, apice obtusiuscula; anfractibus quinque, convexis, gradatim accrescentibus, sutura simplici junctis, sublævigatis, fere politis, lineis nonnullis incrementi transversis obliquis, exilissimis notata; apertura fere verticali, subquadrangulari, intus quinque-dentata, albida; labro undique expansiusculo atque paulum incrassato, extus infra suturam sinuoso, intus profunde bidentato, (dente supero minori), ad basin dente unico minuto et ad medium collumellæ altero fortiori instructo; labio tenui, adnato, extra medium prope angulum posteriorem aperturæ dente lamelliforme bipartito munito.

Long. testæ 2·15, latit. 1', long. apert. 0·8, lat. 0·6 m.m.

Hab.—Penang et in Provincia Wellesley dicta, sub corticem *Cocos nucifera*; testa rarissima.

This is of exactly the same type as the Arrakanese *P. flosa*, described at p. 333 of the Journal for last year, but it is larger, more cylindrical and has one tooth more in the aperture. From *P. Avanica* it differs by less closely wound whorls and by the interal dentition of the aperture.

It appears to be a very rare species. I found one specimen under the bark of a cocoa-nut tree on Penang, and two others on the opposite coast in the Wellesley Province.

PUPA [PUPISOMA] ORCELLA, n. sp. Pl. II, fig. 2.

P. testa subglobose conoidea, apice obtusa, angustissime perforata, tenui, cornea; anfractibus 3·5, valde convexis, sutura simplici junctis, transverse filose striolatis; apertura subrotundata, paululum obliqua, edentula; margine externo tenuissimo vix repandiusculo, columellari albescente, vix torto, supra reflexo, umbilicum fere omnino obtegente.

Alt. testæ 1·7, diam. 1·25, alt. aperturæ 0·6 m.m.

Hab.—Penang, sub corticem *Cocos nucifera*, haud frequens.

The animal is grey with dusky pedicles, but no perceptible trace of tentacles. The species differs from *P. lignicola* (l. cit.) by a shorter and broader form, more convex whorls, and by a very slightly expanded and thin outer lip. In fresh specimens some of the transverse striæ of the cuticle are rather stronger than others, but they very soon wear off.

Fam. Streptaxidæ.

This family is represented by the single species *Ennea bicolor*, occurring with *Stenogyra gracilis*, though not very commonly. (Comp. J. A. S. B., 1871, vol. xl, pt. ii, p. 169).

Fam. Veronicellidæ and Vaginulidæ.

I have collected two species, which are by authors usually referred to the genus *Vaginulus*, and with which Blainville's *Veronicella* is considered as identical.

The one species is the same as *Vaginulus Birmanicus*, briefly described by Theobald in Journ. A. S. B., vol. xxxiii, for 1864. It is found about Calcutta, extending throughout Bengal up to the base of the Sikkim hills, through Arrakan, Tenasserim to Penang. A specimen obtained at Singapore does not appear to differ; E. v. Martens' *V. Hasselti*, (Preuss. Exp. Ost-Asien, Landschnecken, 1867, p. 176, pl. 5, figs. 2 and 4) from Sumatra, Borneo, &c., also appears to be the same, and it seems to me very probable that it is the true *Onchidium molle* of Hasselt.

A second species is very closely allied to *Vaginulus Tourannensis*, Eydoux and Souleyet, (Voyage de la Bonite, pl. 28, figs. 4 to 7), found by Mr. Gaudichaud at Touranne in Cochin China.

A close examination of various eastern species of what authors usually call *Vaginulus* or *Veronicella* appears to me to indicate, that a great confusion has been brought about into the definition of these terms. First of all, we have to return to the typical species of those two generic terms, leaving all subsequent researches regarding other species out of the question.

Blainville's description of his *Veronicella lævis* in 1817 was incorrect as regards the existence of a rudiment of a shell. The mistake was, at least partially, corrected by Blainville in Diet. d. Sc. Nat. vol. 57, p. 348,* and Keferstein, after discussing the opinions about this genus, in Zeitsch. Wiss. Zool., xv, 1864, defined† *Veronicella* as it ought, I think, to be accepted.

The animals have the sexes distinct in one individuum, the male organ under the right peduncle, the female about the middle of the lower right side of the mantle; tentacles bilobed; the anal and respiratory orifices are at the posterior end; the jaw and teeth of the radula resemble those of the HELICIDÆ. Thus the general anatomical structure of *Veronicella* agrees in some respects with *Onchidium* (comp. Stoliczka in J. A. S. B., xxxviii, pt. ii, 1869, p. 88, pl. xiv), but in this genus the female genital opening lies with the two others at, or close to, the posterior end; the teeth are peculiarly hook-shaped, and there is no jaw present. As one of the characteristic figures of a *Veronicella* I may mention *Vag. Solea*, d'Orb., (Voyage dans l' Am. merid., Moll. pl. 21) from Buenos Ayres, or *Vag. Luzonicus*, Eydoux and Souleyet, in Voyage de la Bonite, Zoologie, vol. II, p. 495, pl. 28, figs. 1—3. Thus our species will have provisionally to stand as

VERONICELLA BIRMANICA, (Theob.).

It is found all over the island, up to the top of Penang hill, but is not common, and the specimens are mostly small, about 1 or 1.5 inches. The median dorsal pale stripe generally becomes distinct only in older specimens, and the lower side of the mantle is uniform livid; in very young specimens the pale stripe is absent, and the mantle marked below with dark dots.

The name *Vaginulus* was introduced by Férussac in 1821. Judging from the description of the genus, in part at least, from the arrangement of the species and from the anatomical account given by Blainville, it is, I

* In this article, Blainville strangely makes a great mistake in considering *Vaginulus*, *Veronicella* and *Onchidium* as identical.

† Comp. also Humbert in Mem. Soc. Ph. & Sc. Nat. Genève, vol. xvii, and E. v. Martens Preuss. Exped. p. 175, *Vaginulus*.

think, clear, that Férussac considered the first described species, *V. Taurinaysi* as the type of the genus, (Comp. Moll. terr. and fluv., II, pp. 96 p, 96 q, and explic. des pl. No. 13, pl. 8 c.). Férussac's characteristic of the genus places the pulmonary opening at a distance of two-fifths of the length of the body from the anterior end, and on the lower right side of the mantle; the female sexual opening is said to be on the same side, about the middle; the position of the anus is not mentioned. Blainville's account of the anatomy is not clear and partly contradictory to Férussac's statement. Some of the figures appear to leave no doubt that the position of the female sexual organ is the same as that indicated by Férussac, in others (fig. I and III,) its situation is too much backward. The anus appears to be situated according to figure I near the sexual opening, but again it is said to terminate with the anus at the posterior upper end of the foot. In the figures II and III (l. cit.), which give an insight into the whole anatomy of the animal, the true termination of the intestines is nowhere given. All this is very unsatisfactory.

Eydoux and Souleyet in their figure of *Vaginulus Tourannensis* also record a small opening at the posterior lower right end of the mantle. I can scarcely believe that this is correct; it is probably only a fault of the artist who thought that an opening must exist there, because it is clearly seen in the other species on the same plate, *Vag. Luzonicus*, which is a *Veronicella*.

My reason for doubting the correctness of Eydoux and Souleyet's figure is the very careful examination of the Penang species, which, as already mentioned, is closely allied to *V. Tourannensis*, if not really identical with it.

The Penang species has the following generic characters, as compared with those of *Veronicella*.

The sexes are distinct, the male opening is under the right peduncle, the female sexual opening lies, together with the anus and the pulmonary orifice, at the lower right side of the mantle, about two-fifths of the length of the body distant from the front. The sexual opening is nearest to the edge of the foot, then comes the anal and then the respiratory one; they are only separated by thin laminae from each other. There is no jaw present, the manducatory organ consisting of a simple muscular tube, much as in *Strep-taxis* or *Testacella*; the radula is short, composed of simple pointed teeth which are absolutely identical with those of the two last mentioned genera. There is no opening whatsoever at the posterior end of the foot or mantle; the pointed end of the intestinal organs is only attached by a bundle of muscles to the terminal inner surface of the mantle.

On p. 96 of Férussac's Moll. ter. and fluv., Blainville says that the upper

border of the mouth is provided with a dental comb ('peigne dentaire'), and further on, that the buccal cavity is supplied on its inner upper surface with very small sharp points ('très petites pointes acérées'). The latter statement evidently refers to sharp pointed teeth of the radula, but does the former mean to indicate the presence of a jaw, such as exists in *Veronicella*? This is a question of great importance; for if the presence of a jaw can be proved, it would certainly not support the generic identification of our Penang *Vaginulus* with *Vag. Taunaysii*.

There are also a few peculiarities in the other anatomical structure, but on the whole this latter well agrees with that given by Blainville of *Vag. Taunaysii*, with the exception of one or two organs which he evidently misinterpreted.

My doubts against a generic identity of *V. Taunaysii* with *Veronicella*, as formerly defined, appear to me to be supported also by external differences in the shape of the body. In *V. Taunaysii*, as well as in the Penang species and in *V. Tourannensis*, the body is slender and high, so to say nearly cylindrical, the globules on the tentacles are well developed, the appendages of the latter large, the posterior end of the foot is pointed and somewhat projecting beyond the termination of the mantle. In *Veronicella*, on the contrary, the body is more depressed and of a generally more ovate shape, the lower appendage on the tentacles is smaller than the tentacle itself, the end of the foot is more rounded and not, as a rule at least, projecting beyond the termination of the mantle.

E. v. Martens, when speaking of *V. Taunaysii* (Preuss. Exp. nach Ost-Asien, Landschnecken, p. 6), says that the slight lateral expansion of the mantle and the higher body distinguish it from all other species collected in India, and this opinion is, I think, strongly in favour of my presumed distinction between *Veronicella* and *Vaginulus*; for it also exactly applies to the Penang species.

Finally, I must draw the attention to the remarkable external similarity in the form of the body of *Vaginulus porulosus*, Fér. (Moll. ter. et fluv. II, p. 96', pl. 8 E, fig. 5) with that of *Testacella*. The former species is recorded after a drawing communicated to Férussac by van Hasselt, and is no doubt from Java or one of the adjoining islands. I think it represents a true *Vaginulus*, and not a *Veronicella*.

I have placed the above discussion before my malacological friends, because I consider a satisfactory solution of the points in question of considerable importance. The information is not easily obtainable, as the necessary materials are very much scattered about. If my suppositions prove correct, the so called AGNATHA group, and especially the TESTACELLIDÆ or STREPTAXIDÆ, will appear before us in a quite different light, when compared with the other

groups. They will shew that certain characters remain constant under different physical conditions, while others change, and that the change takes place according to certain principles, affecting similar or the same organs. Extended observations of this kind must give us the key to a correct systematic arrangement.

Our special question cannot be solved, unless Blainville's and Férussac's somewhat contradictory accounts of the structure and anatomy of *Vaginulus Tuunaysii* had been satisfactorily settled. I hope to have myself an early opportunity of examining one of these animals, and until such a time I will postpone the detailed description of the Penang species, (and of another new one from Sikkin), together with their anatomy, which requires a careful comparison with that of *Vaginulus* and *Onchidium*, of each of which I will have to describe several interesting new forms.

Explanation of plates.

Plate I.

- Figs. 1—3. *Rhysota Cymatium*, (Benson), p. 11; a young, an adolescent and an adult shell.
 „ 4—7. *Rotula bijuga*, n. sp., p. 14; four full grown specimens, variable in the height of the spire.
 „ 8. *Sitala carinifera*, n. sp., p. 16; 8, natural size; 8a, 8b, 8c, enlarged views.
 „ 9. *Macrochlamys stephoides*, n. sp., p. 17; three views in natural size.
 „ 10. *Microcystis palmicola*, n. sp., p. 18; 10, natural size; 10a, 10b, 10c, three views enlarged.
 „ 11. *Helicarion permolle*, n. sp., p. 18; 11, twice the natural size; 11a, 11b, 11c, 11d, views in natural size.
 „ 12. *Vitrina nucleata*, n. sp., p. 23; 12, front view in twice the natural size; 12a, 12b, 12c, three views in natural size.
 „ 13. *Trochomorpha Cantoriana*, (Benson), p. 22; three views in natural size.
 „ 14—16. „ *castra*, (Benson), p. 21; 14, 14a, 14b, three views in natural size; 15, side view of a specimen from Calcutta; 16 and 16a, top and lower views of a Darjiling specimen.
 „ 17. *Timorensis*, Mart., p. 22; four views in natural size.

Plate II.

- Figs. 1—3. *Fruticicola similis*, Fér., p. 26.
 „ 4—6. *Vitrina nucleata*, Stol., p. 23; 4a, represents the side view of the problematic amatorial organ enclosed in the *bursa seminalis*.
 „ 7—9. *Trochomorpha castra*, (Benson), p. 21.
 „ 10—12. „ *Timorensis*, Mart.; p. 22.
 „ 13—15. *Rhysota cymatium*, (Bens.); p. 11.
 „ 16—18. *Rotula bijuga*, n. sp., p. 14.
 „ 19—20. *Macrochlamys stephoides*, n. sp., p. 17.
 „ 21—30. *Helicarion permolle*, n. sp., p. 18.

All the figures are enlarged; the measurements in natural size are given in the text referred to.

Plate III.

- Figs. 1. *Trachia Penangensis*, n. sp., p. 24; three views in natural size.
 „ 2. *Pupa* [*Pupisoma*] *orcella*, n. sp., p. 33; 2, natural size, 2a, 2b, enlarged.
 „ 3. *Pupa* [*Scopelophila*] *palmira*, n. sp., p. 32; 3, natural size, and two views enlarged.
 „ 4—6. *Clausilia* [*Phædusa*] *Penangensis*, n. sp., p. 27; 4, 4a, attenuated var.; 5, elongately fusiform var.; 6, 6a, fusiform variety; all figures in natural size.
 „ 7—8. *Clausilia* [*Phædusa*] *filicostata*, n. sp., p. 28; views of two different specimens in natural size.
 „ 9—14. *Philomicus pictus*, n. sp., p. 30; 9, 9a, 9b, three views taken from a specimen in spirit; 10 and 11, two views of the same specimen in different states of expansion, taken from life; all these figures are in natural size, but the other figures, representing the genital organs, the jaw and teeth, are enlarged.
 „ 15—17. *Clausilia Penangensis*, vide p. 27.
 „ 18—20. *Trachia Penangensis*, vide p. 24.

Explanation of the letters used on pl. II and III.

- ho = hermaphrodite opening.
 ut = uterus.
 al = albuminous gland.
 vd = vas deferens.
 ag = amatorial gland.
 p = penis.
 m = retractile muscle.
 rs = receptaculum seminis.
 po = pulmonary opening.
 an = inner, or posterior, angle of mouth.
 pn = peripheral angle.
 u = umbilicus.
 rs = right shell-lobe.
 rn = „ neck lobe.
 ls = left shell lobe.
 ln = left neck lobe.

The small letters below the teeth refer to the distance of each tooth from the respective central tooth in each series.

ON NEPHROPSIS STEWARTI, A NEW GENUS AND SPECIES OF MACRUROUS CRUSTACEANS, DREDGED IN DEEP WATER OFF THE EASTERN COAST OF THE ANDAMAN ISLANDS,—by JAS. WOOD-MASON.

(Read 7th August, 1872, received 16th January, 1873).

[With plate IV.]

In April of last year, I was deputed by the Trustees of the Indian Museum, with the sanction of the Government of India, to proceed to the Andaman Islands for the purpose of making a collection illustrative of the marine fauna of that part of the sea of Bengal in which those islands are situated. I reached Port Blair about the 6th of April, and immediately put myself in communication with the Chief Commissioner, who at once placed at my disposal a well-manned boat and a small steam-launch, with which I dredged for nearly two months with much success from low-water line down to near 50 fathoms. Towards the end of my stay, General Stewart knowing my intense desire to try my fortune in deeper water, placed at my disposal for one day the S. S. "Undaunted" which had been recently armed and put into commission for service as a guard ship. The time allowed was short, but sufficiently long to enable me to bring away samples of the life supported by the sea-bed at, and beyond, the 100 fathoms' line, and to ascertain that the sea-bed was uniformly covered with a thick deposit of fine olive-coloured mud derived from the waste of the coral-reefs and of the sandstone and serpentine rocks of the islands.* This mud was not very productive, yielding only a few annelids, but was crowded with dead shells of Pteropods and *Dentalium* and with fragments of a large Brachiopod.

It was in the last cast of the dredge that I had the good fortune to capture the interesting addition to the crustacean fauna of these seas, described in the following pages. It is closely allied to *Nephrops Norvegicus* of northern European seas, so closely allied, indeed, that were it not for the absence of the squamiform appendage of the antennæ, I should be under the necessity of placing it in the same genus as a second species. The absence of this appendage, however, leaves me no choice but to establish a new genus for its reception.

* The following rough analysis by Mr. Tween, the chemist of the Geological Survey of India, will show the proportion of insoluble matter :

Soluble in H Cl mostly Ca O Co ₂ ,	42·8
Insoluble clay and sand,	57·2

100·0

The discovery in these warm seas of a very near, of the nearest ally in fact, of so characteristic a cold-water species, remarkable though it is, will not appear so surprising when I mention the fact that my crustacean lived and burrowed in the mud of the sea-bed at a depth of nearly 300 fathoms in a temperature not certainly exceeding 50° Fahr.

One of the chief points of interest attaching to this new form lies in the loss of its organs of vision by disuse, as in *Calocaris MacAndrewæ*, Bell, in *Cambarus pellucidus*—a member of the same family as that to which *Nephropsis* belongs—and in the other crustaceans and animals inhabiting the caves of Carniola and Kentucky. I not only agree with Mr. Darwin* in attributing the loss of the eyes to disuse, but I also regard the great length and delicacy of the antennæ, and the great development of the auditory organs as modifications effected by natural selection in compensation for blindness.†

NEPHROPSIS, gen. nov.

Diag. *Antennal scale absent.*

NEPHROPSIS STEWARTI, sp. nov. Pl. IV.

Body covered with fine rounded tubercles and with a short but dense pubescence. The carapace is sub-ovoid, armed on each side, just externally to the base of the rostrum, and behind the anterior margin, with an acute forwardly directed spine; a similar spine springs from each side of the anterior margin itself at about the level of the upper surface of the antennal peduncle; the basis of each of these two spines is confluent with a conspicuous convexity to be seen just behind it; immediately in front of each of these convexities lies a smooth, slightly excavated surface bounded in front by a curvilinear row of tubercles. The cervical suture, dividing the carapace into an anterior or cephalostegal, and into a posterior or omostegal portion, is broad and deeply impressed mesially and laterally, until it reaches the level

* Origin of Species, 5th Edit., pp. 171-173.

† Since these remarks appeared in the abstract of my paper (Proc. Asiat. Soc. Ben. viii, 1872, p. 151) Dr. Hagen's Monograph of N. American *Astacide* has reached Calcutta, and from it I give the following extract, on account of its obvious applicability to the species here described, merely remarking that the perusal of it led me to note also the stoutness of the rostrum and the great development of the cephalostegal spines in *Nephropsis* as compared with the slenderness of the one and the minuteness of the others in *Nephrops*: "But it seems to be a somewhat well recognized law in nature (Rathke, Metamorph. Retrograd., p. 135) that if any part is atrophied, or stopped in development, the nearest parts show an abnormal increase of development. This is apparently the case in *C. pellucidus*; the eyes are atrophied, and the rostrum, the fore border of the cephalothorax, the antennal lamina, the basal joint of the inner antennæ, and the epistoma are altered or largely developed." Op. Cit. 34.

of the anterior margin of the epistoma when it bends boldly upwards and backwards upon itself passing into the well-defined semicircular depression that bounds the lateral convexities described above. The cardiac region is broader than long, very convex transversely and bounded on each side by a densely-tuberculated elevation which running backwards, downwards, and forwards along the line of the granulated rim of the branchiostegite, and finally bending upwards almost opposite the origin of the second pair of abdominal appendages, passes again into the swollen anterior boundary of the omostegite; the ovoidal area thus limited off is more sparsely beset with tubercles and presents a marked depression on its anterior half.

The rostrum carries on each side a most acute spine directed upwards and forwards, and curved slightly inwards; and above presents two roughly granulated ridges coalescent towards the tip but divergent at the base; beyond the spines it is canaliculate on each side, above and below, and each lateral ridge is fringed with long hairs; below it is carinated and coarsely granulated at the base. A faint linear impression, continuous with the groove between the ridges on the rostrum, passes along the middle line of the carapace almost to its posterior border; situated in this line, and marking the anterior limit of the convex gastric region, lies an almost erect spiniform tubercle.

Antennæ and antennules.—The peduncles of these appendages lie as in *Nephrops Norvegicus* in the same horizontal line, and their inner margins are ciliate. The basal joint, or coxocerite, of the former is extremely short, and wants the apical spine in *Nephrops*, but the perforated conical process on its inferior surface is remarkably salient; the second is devoid both of the prominent spine into which, in *Nephrops*, its distal and external angle is produced, and of the squamiform appendage or scale seen in all the other recognized genera of *Astacidae*,* and developed to such an extraordinary degree in Carideous Crustacea; one or two small folds or impressions between, or upon, the second and fourth joints being all that remains of the antennal scale, and of the rudimentary joint that in *Nephrops* corresponds to the moveable spine of *Astacus*.†

* The antennal scale in *Astacoides* escaped the notice of Guérin who founded his genus on its supposed absence.

† There appears to be no doubt but that the antennal scale is the representative of the outer of the two appendages borne upon the protopodite at an early stage of embryonic life, and, if the moveable spine in *Astacus* and its undoubted homologue in the antennæ of *Nephrops* represent the inner of these appendages, then must the three distal joints of the peduncle with the flagellum be looked upon, as Dr. Fritz Müller looks upon them, as a new formation (Neubildung) and no longer as being in serial homology with the five distal joints of the other appendages, *e. g.*, of an ambulatory leg, which represent the endopodite, the exopodite being completely aborted or represented at most, as Rolleston remarks, by the annular constriction on

The flagella of the antennæ are remarkably long and of excessive fineness at their extremities.

The basal joint of the antennules has its upper surface greatly inflated, owing to the remarkable development of the auditory organ to which, in most Podophthalmatous Crustacea at any rate,* this joint gives lodgment; and the almost globular appearance of the joint as seen from the side contrasts strongly with the flatness of its upper surface in *Nephrops* or *Astacus*. Of the two remaining joints of the antennular peduncle, the first is short and cylindrical, being less than half the length of the last which in *Nephrops* is short and equal to that which precedes it. The peduncle terminates in the usual manner in a double flagellum, the outer branch of which is conspicuously stouter than its filamentous and cylindrical fellow, perceptibly compressed, and thickly fringed below with short hairs along its distal third.

The *epistoma* is much the same as in *Nephrops*, save that its posterior edge is straight and presents two small tubercles which give it the appearance of being slightly roundly-emarginate in the middle.

The *external maxillipeds* and the parts of the mouth in front of them are identical in structure with those of *Nephrops*.

The *eyes* are completely rudimentary, neither pigment nor corneal membrane being developed; the peduncles indeed are present, but even these are short, subcylindrical, mere aborted structures, concealed entirely from view by the stout base of the overhanging rostrum; in spirit they have become perfectly blanched like the rest of the appendages, but in life the delicate rose-pink coloration of the animal extended itself to their very tips. The peduncles are far less conspicuous from the side view than represented in the plate.

The first pair of *abdominal appendages*, those which bear the great *chelæ*, are unfortunately absent, the specimen having lost its claws a considerable period previous to its capture, as the presence of uncalcified reproduced rudiments of these appendages indicates; the other legs are smooth and slender; the second and third pairs are didactyle; of these the former has both its upper and lower margins, from the base of the carpopodite to the extremity of the claws, fringed with long hairs; the latter, much the slenderer as well as the longer of the two, has its propodite greatly elongated, and its claws only are ciliated. The fourth pair, the longest of all and ciliated only on the outer face of the dactylopodite, and the fifth, about as long as the second pair, are monodactyle.

the ischiopodite. For the facts relating to the transformation of the embryonic exopodite into the antennal scale of the Prawn *pari passu* with the budding out of the flagellum and the abortion of the endopodite, *vide* Fritz Müller's admirable essay on the development of the crustacea entitled "Für Darwin," p. 41, fig. 31.

* The caudal ear of *Mysis* forms an exception to this.

The last abdominal somite is immoveably united to that which precedes it as in *Nephrops* and the common Lobster;* and the sternum is linear as in the *Astacidae* generally.

Post-abdomen.—The post-abdomen is gradually attenuated to the extremity of the telson. The appendages of its first somite are as completely rudimentary as they are in the female of *Nephrops Norvegicus*;† those which follow are long and slender, their foliaceous branches being very narrow, produced to a sharp point, and fringed with excessively long cilia. All the terga are covered with minute rounded tubercles, and present at their anterior ends, just behind the tergal facets, a broad smooth transverse groove with its hinder margin convex backwards.

The pleuron of the first somite is precisely similar to that of *Nephrops Norvegicus*, but those of the remaining somites are even more acutely triangular than in that species, and have their margins denticulate and furnished with a fringe of long cilia. In all the somites, with the single exception of the first, the tergal and pleural regions are most sharply defined as such, the former not curving continuously with the latter but terminating abruptly at the level of the ventral chords in a line convex outwards; so that, if a somite were detached, deprived of its ventral chord and flattened out on the table with its dorsal surface uppermost, the imaginary continuation from pleuron to pleuron of the plane in which these pleura laid, would pass below that of the surface of the tergum.

The 'swimmeret' constituted as in all other Macrurous Crustacea by the highly modified and backwardly placed appendages of the last postabdominal somite and by the 'telson,' differs in no particular of more than specific value from that of *Nephrops*; the mesial element, or *telson*, is longer in proportion to its breadth, its greatest breadth, being a transverse line separating its anterior from its middle third, and not at the base as in *Nephrops*, is slightly more truncate posteriorly, and the oblique rounded elevations, that gradually narrow as they pass backwards into the spines at its postero-

* On characters furnished by the claws alone Dana artificially divides the recognized genera of *Astacidae* into two groups, typified respectively by *Astacus* and *Nephrops*; the first of these is further subdivided according to the number of the branchiae and the mobility or immobility of the last abdominal somite. But no mention is made of the fact that this is firmly fixed in *Nephrops* too. If *Paranephrops*, a genus including only freshwater forms, should turn out to have a mobile last abdominal somite, then we shall have this curious fact presented to us, viz., that all those members of the family *Astacidae* which live in freshwater or are terrestrial (*Engaus*) have this somite moveably united by membrane only to that which precedes, while those of them that are marine have it fixedly united to the rest of the sternum.

† The ventral plates of the 2nd, 3rd and 4th postabdominal somites in the males of *Nephrops Norvegicus* have an erect spine in the middle line, but the females exhibit no trace of such.

lateral angles, are stronger than in *Nephrops*. The outer plate of the lateral elements of the swimmeret is moveably articulated at its posterior third as in the rest of the *Astacidae*, but the sutural line is curved and the posterior margin of the proximal and larger division exhibits hardly a trace of the overlapping denticulations seen in other *Astacidae*.

Length from tip of rostrum to the posterior margin of telson, 98 mm.

Length of carapace in middle line, 42 mm.

„ „ postabdomen,..... 56 mm.

therefore the postabdomen : carapace (rostrum incl.) :: $1\frac{1}{3}$: 1 exactly.

and the length of body : that of postabdomen :: $1\frac{1}{4}$: 1 „

The only specimen (a female) obtained was dredged in from 260 to 300 fathoms about 25 miles off Ross Island on the eastern coast of the Andamans. That the specimen was really brought up from this great depth is certain from the unmistakeable signs of crushing from contact with the lip of the dredge, from its position in the dredge bag and from its firmly adherent greenish coating which appears to indicate that like *Calocaris MacAndrewæ* it was a burrower.

In conclusion I have to thank Captain Beresford, the commander of the vessel, for his skilful management of the sounding-line and for the zeal displayed by him in carrying out my wishes during our too short cruise.

I have much pleasure in connecting with this extremely interesting species the name of Major General Donald M. Stewart, C. B., Chief-Commissioner of the Andaman and Nicobar Islands, to whose ever ready help the success of my trip was so largely due.

Explanation of Plate IV.

Fig. 1. *Nephropsis Stewarti*, ♀, nat. size.

Fig. 2. Upper view of carapace of the same.

Fig. 3. Swimmeret of *N. Stewarti*.

Fig. 4. „ „ *Nephrops Norvegicus*.

Fig. 5. Inferior view of antennary region of *N. Stewarti*.

Fig. 6. „ „ „ „ „ *N. Norvegicus*.

Fig. 7. Sternal region of *N. Stewarti*.

Fig. 8. „ „ „ *N. Norvegicus*.

ON NEW OR LITTLE KNOWN SPECIES OF PHASMIDÆ. PART I,—*Genus Bacillus*,—by JAMES WOOD-MASON of *Queen's College, Oxford*.

(Read 7th August, 1872; received February 9th, 1873).

[With plates V, VI and VII.]

The difficulties that have hitherto defied all attempts at anything like a philosophical and natural classification of this interesting and truly remarkable family of Orthopterous Insects, although in a great measure due to the extraordinary extent to which protective modification has involved all parts of the body throughout the group, must be in part, at any rate, ascribed to our ignorance in so many cases of the opposite sexes of the species; and the discovery that *Acanthoderus lacertinus*, Westw. is the female of *Lonchodes luteoviridis* of the same author, renders it extremely probable that these latter difficulties will be found to be further complicated by other cases of the same nature. As instances of the value of a knowledge of the opposite sexes in the limitation of genera, I need only adduce the fact that the capture of *Acanthoderus bicoronatus*, West., and *Acanthoderus semiarmatus*, Westw., in copula with their respective males will necessitate the removal of those species, together with their allies, to the genus *Lonchodes*. Thus at the very outset of my researches, I am enabled, by the inestimable advantage of a residence in the great distributional area or metropolis of the family, to withdraw from a genus some of the most *bizarre* of its extremely heterogeneous contents. Since the publication in 1859 of Professor Westwood's classical Monograph of the family, a large number of new or imperfectly known species has been described or remarked upon by various authors,* but chiefly by

* Giebel, Zeitschrift für d. gesamt. Naturwissensch. xviii, p. 113.

Stål, Ofversigt af Kon. Vetensk. Akad. Förhand. xv, p. 308.

Coquerel, Ann. Soc. Entom. Fr. 1861, p. 495, pl. 9, fig. 1; Bull. Soc. Ent. Fr. 1866, pp. xxiii-xxiv.

Westwood, Proc. Ent. Soc. Lond, 1864, p. 16; Ann. Soc. Ent. Fr. 4e Sér. t. iv, pl. 6.

Walsh, Proc. Ent. Soc. Phil., iii, p. 409.

Philippi, Stettin Ent. Zeit. 1865, p. 64.

Murray, Ann. and Mag. N. H. 3rd Ser. xviii, p. 265-268.

Kaup, Proc. Zool. Soc. Lond. 1866, pp. 577-578.

Scudder, Proc. Bost. Soc. Nat. Hist. xii, pp. 99 and 340.

Lucas, Ann. Soc. Ent. Fr. 4me Série, t. ix, Bulletin, p. xxv.

Gerstaecker, Archiv für Naturgesch. xxxv, p. 211.

Bates,* de Saussure† and Kaup‡ whom I mention by name on account of the extent and of the extreme value of their contributions. These numerous additions will be enumerated under the genera to which they belong.

GENUS 1.—BACILLUS, LATR.

Eleven new species have been referred to this genus since the appearance of Professor Westwood's monograph; of these one, viz., *B. patellifer*, Bates, is nearly certainly identical with *B. ? Artemis*, Westw., and two others, viz. *B. gramineus* and *aspericollis*, Bates, are most probably, as indeed the author of those species himself suspects, the opposite sexes of one species. The necessary deductions being made, eight remain, which, added together with those described below to the thirty-eight recognized by Westwood, bring up the total of known species of *Bacillus* to fifty-five.

BACILLUS FUSCOLINEATUS, n. sp. Pl. V. Fig. 7.

♂ Extremely slender, filiform, cylindrical. Antennæ of the length of the metathorax, 17-jointed; first joint depressed but not expanded, carinate above, with sub-parallel margins, the inner one of which is raised; second joint nearly twice as long as broad, sub-depressed; the rest filiform. Head scarcely narrowed from the eyes; a brown streak passes from the eye along

* Descriptions of Fifty-two New Species of Phasmidæ, with Remarks on the Family, Trans. Linn. Soc. Lond. Vol. xxv, pt. I, pp. 321-359, pl. xlv, xlv.

† Rev. et Mag. de Zool. 1859.

Ann. de la Soc. Ent. de Fr. iv, Sér.

Rev. et Mag. Zool. 1861.

Phasmidarum nov. species nonnullæ. Rev. et Mag. de Zool. 1863. pp. 63-70.

Mélanges Orthoptérologiques, 2me Fasc. Mém. Soc. Phys. de Genève, xx, pt. 1, pp. 227-326, pl. 2, 3.

‡ Ueber die Eier der Phasmiden. Berlin Entomologische Zeitschrift, Vol. 15, 1870. Neue Phasmidæ.

Bacillus (Ramulus) Humberti, ♂ ♀, (= *Lonchodes* sp.) Saussure, Ann. Soc. Ent. Fr. 1861, p. 469. Hab. Ceylon.

Bacillus (Baculum) ramosus, ♀, Sauss. Revue de Zool. 1861, 128, et Mém. Orth. Fasc. II, p. 114. Hab. Brazil. (?)

Bacillus carinulatus, Sauss. ♂ ♀, Revue de Zool. 1863, 63 1. et Mém. Orth. 1869. Fasc. II, p. III, Pl. II, fig. 1. ♀ Hab. Ceylon.

Bacillus gramineus, Bates, ♂ Trans. Lin. Soc. Lond. 1865, pt. I, p. 326, pl. xlv, fig. 4. Hab. Natal.

Bacillus aspericollis, Bates, ♀, l. c., p. 327. Hab. Natal.

Bacillus Guenzii, Bates, ♂ l. c., p. 327, Pl. xlv, f. 14 a. Hab. Natal.

Bacillus patellifer, Bates, ♀ (? = *Bacillus ? Artemis*, Westwood), l. c., p. 328. Hab. Darjiling!!!

Bacillus Scytale, Bates, ♀, l. c., p. 328, pl. xlv, fig. 9. Hab. Ceylon.

Bacillus leprosus, Gerst., ♀, Arch. für Naturgesch. xxxv, p. 211. Hab. Zanzibar.

Bacillus Gerhardtii, Kaup, ♂, Proc. Zool. Soc. Lond. 1866. Hab. New Zealand.

Bacillus Geisovii, ♂, Kaup, loc. cit.,

each side of the body as far as the commencement of the fourth abdominal segment where it becomes somewhat interrupted; the interval between this line and the margins of the dorsal arcs of the body is silvery white; below, the insect is of an uniform light yellowish green; above, between the brown lateral lines, darker green; the meso- and meta-notum are indistinctly carinate down the middle, and under a moderately powerful lens appear to be marked with delicate wavy transverse striæ; the striation becomes less distinct on the abdominal segments. The abdomen is slightly expanded at the junction of its 4th and 5th segments from which latter it sensibly decreases in width to the apex of the seventh, whence it widens to a trifling extent; seventh segment equal to about $1\frac{1}{2}$ times the 8th, exactly twice as long as the 9th which is obtusely rounded at the extremity and above presents a median and two lateral less distinct ridges; these latter curve inwards at their apical ends, enclosing a shield-shaped area. Posterior margin of the terminal ventral segment slightly emarginate.

Legs simple, of excessive tenuity; anterior very slightly longer than the posterior pair; intermediate shorter by the length of their own tibia than the former. Cerci long, obtuse, porrected beyond the apex of the abdomen, slightly forcipated and grooved at the sides.

Total length 22 lines; head $1\frac{1}{4}$, prothorax 1, mesothorax $4\frac{1}{2}$, meta-thorax $3\frac{1}{2}$, abdomen $9\frac{1}{2} + 2\frac{1}{4} = 11\frac{3}{4}$; antennæ $3\frac{1}{2}$.

Hab. Murree, Panjâb. One specimen collected by Dr. W. Waagen.

BACILLUS HISPIDULUS, n. sp. Pl. VII. Figs. 2-3.

♂ Filiform, slender, sordid, with a dark-green median dorsal streak, extending from the apex of the mesothorax to the extremity of the abdomen. Head sub-ovate, with the sides slightly convergent posteriorly, antennæ 16-jointed, joints very distinct; first joint depressed but not expanded; second twice as long as broad, cylindrical, its proximal end the broader. Mesothorax hardly narrower in front than behind. Meso- and meta-notum with a raised median line and a few minute tubercles on their lateral margins. Abdomen cylindrical and filiform to the apex of the 6th segment, whence it suddenly expands to the junction of the 7th and 8th, whence it narrows to its truncate extremity which appears to be constricted between the 8th and 9th segments; six basal segments slightly expanded at their articular ends; 9th segment strongly carinate; the cerci curved and projecting at its postero-lateral angles.

Legs long, slender, and simple; first joint of anterior tarsi greatly elongated; rather more than twice as long as the remaining joints taken together.

Total length $24\frac{1}{2}$ lines, antennæ 4, head $1\frac{1}{4}$, proth. 1, mesoth. $5\frac{1}{2}$, metath. $4\frac{1}{4}$, abd. $10\frac{1}{4} + 2\frac{1}{4} = 12\frac{1}{2}$ lines.

♀ Much more robust, with a well-defined median raised dorsal line along the whole length of the body, antennæ absolutely shorter than those of the male, but with the basal joint strongly carinate and more expanded. The mesothorax is visibly attenuated in front from the commencement of its apical third, meso- and meta-notum with a few minute warts along their lateral margins; meso- and meta-sternum with a few similar warts scattered over their surface.

The abdomen is sub-fusiform, depressed to the apex of the 6th segment, and has a distinct ridge, which can also be detected on the thorax, running internally and parallel to the lateral margins of all its dorsal segments except the last; its five posterior segments have another ridge on each side midway between their sides and the median ridge. The posterior margin of the sixth ventral is produced in the middle into a sharp spine with a broad base. The seventh segment is nearly as long as the two last together; these are subequal. The last is subtruncate at its extremity beyond which projects a small triangular azygos plate carinated above. Cerci, in form of a tall four-sided pyramid with its angles rounded, project at the postero-lateral angles of last segment.

Operculum spatulate in outline and flat below, with a broadly rounded extremity, not extending beyond the middle of the last segment.

First joint of tarsus in anterior legs as in the male. The body is covered with very short setæ in both sexes.

Total length, 34 lines, ant. $3\frac{1}{2}$, head $2\frac{1}{2}$, proth. $1\frac{1}{2}$, mesoth. $7\frac{1}{2}$, metath. $5\frac{1}{2}$, abd. $15\frac{1}{2} + 2\frac{3}{4} = 17\frac{3}{4}$ lines.

Hab.—South Andaman. Three males and three females, of which two were taken *in copulâ*.

I have received from Dr. Stoliczka, who obtained it from the Arakan coast, an insect differing from the male insect above described only in its greater length, in the absence of tubercles on the thorax, and in having two more joints to the antennæ; the measurements are as follows:

Total length 32 lines: ant. 6, head $1\frac{1}{2}$, proth. $1\frac{1}{2}$, mesoth. $7\frac{1}{2}$, metath. 6, abd. $13 + 2\frac{1}{2} = 15\frac{1}{2}$ lines.

BACILLUS OXYTENES, n. sp. Pl. V. Fig. 3.

♀ Excessively long and slender. Head unarmed, narrow, almost cylindrical, being but slightly broader in front than posteriorly, notched behind in middle. Antennæ 28-jointed, as long as the terminal segment of the abdomen; first joint depressed, carinated above and expanded, second longer than broad, also depressed. Mesothorax much longer than the metathorax, sparsely granulated above and below, slightly expanded at the insertion of the legs, otherwise of perfectly uniform width; meta-thorax with only a few scattered granules above and below; meso- and meta-notum with a dark raised mesial line. Abdomen long, perfectly smooth, very gradually and

regularly attenuated from its base to its almost indescribably acute, deeply-cleft, slightly recurved, and strongly compressed extremity. The seventh segment is hardly twice as long as the 8th, which is about a fifth of the length of the last; this has a perceptible upward curvature and is cleft nearly to the insertion of the minute conical *cerci*. The operculum is subdepressed, acutely pointed at the extremity, carinated below and reaches the commencement of the middle third of the last segment, where the *cerci* are inserted.

Legs long, but rather stout as compared with the body, triquetrous; the fore femora are serrated for more than two-thirds of the length of the straight portion, intermediate femora with two or three triangular spines close together above near the base; posterior ones with one or two. Tibiæ with a well defined but not very salient foliaceous carina below; four posterior ones with minute spinules on all their crests. The right middle leg is a reproduced limb, having but four joints to the tarsus and a single spine on the femur.

Total length of the body 4 in. 9 lines; antennæ $6\frac{1}{2}$: head $2\frac{1}{2}$; proth. 2; mesoth. $11\frac{1}{2}$; metath. $8\frac{1}{2}$; abdomen $23\frac{1}{2} + 10 = 33\frac{1}{2}$ lines.

Abdomen: rest of body :: 1.4255 &c.: 1.

Hab.—Pegu Yomah, collected by Mr. S. Kurz, the botanist at the Calcutta Botanic Garden, during his recent botanical tour through Burma and the Tenasserim Provinces.

In the form of the terminal segments of the body, this species approaches *B. Regulus*, Westw. ♀ (Cat. p. 8, Pl. XXII).

BACILLUS LÆVIGATUS, Pl. V. Fig. 4.

♀ Very slender and cylindrical and smooth. The head is armed with two minute blunt erect spines between the eyes, and is slightly narrowed behind; its posterior margin with 3 or 4 notches. Antennæ exactly half the length of the mesothorax; first joint depressed and somewhat expanded, feebly carinate above, its outer margin more convex than the inner; second joint fully as broad as long, depressed.

Abdomen extremely long and slender, tapering very gradually to the apex of the seventh segment; whence it very slightly expands to the basal half of the last which suddenly narrows to its extremity; this is divided by a short cleft into rounded tips. 7th dorsal segment equal to 8th, half as long as the last which is carinate above. *Cerci* pointed. Operculum narrow depressed, obtusely pointed, reaching the end of basal third of last segment.

Legs simple; anterior pair tolerably long; anterior femora serrated for three-fourth of the length of upper crest. The first joint of anterior tarsi is twice the length of its homologue in the intermediate legs, which is rather shorter than that of the posterior legs.

Total length of body 2 in. 10 lin, ant. $3\frac{1}{4}$, head $1\frac{3}{4}$, proth. $1\frac{1}{4}$, mesoth. $6\frac{1}{2}$, metath. 5, abd. $15\frac{3}{4} + 3\frac{3}{4} = 19\frac{1}{2}$ lines.

Hab.—Samagooting, Naga Hills, Assam. One immature specimen collected by Captain Butler. This species is closely allied to *B. Westwoodii*.

BACILLUS WESTWOODII, n. sp. Pl. VI. Fig. 3.

♀ Elongate, slender, sub-cylindrical, convex. Head narrowed from the eyes to the base, with its sides slightly convex, armed between the eyes with two forwardly and slightly outwardly directed spines; and with its posterior margin faintly notched in the middle and on each side. Antennæ more than half as long as the mesothorax, from 21 to 26-jointed; first joint carinated above and depressed but not expanded; second joint nearly as broad as long; the rest filiform with the exception of the last which is thickened at the tip. Mesothorax slightly narrowed in front and, with the metathorax, somewhat expanded at the insertion of the legs. The abdomen is narrowed from the base to the apex of the first segment, expands again to the apex of the second, maintains pretty much an uniform width for the next two or three segments and finally gradually tapers to a point. The seventh dorsal segment is twice the length of the eighth, but hardly exceeds the last. This is cleft and slightly compressed at the extremity. The operculum is somewhat boat-shaped, below strongly carinate for its posterior half, and comes into such close and complete opposition with the margins of the terminal dorsal segments, with which it is coincident, as to conceal from view the genital parts, permitting only the tips of the *cerci* to emerge. Legs triquetrous, their edges beset with short cilia; straight portion of upper edge of fore femora serrated nearly to the apical end; the intermediate and hind femora have a triangular spine below at the apex; all the tibiæ have a foliaceous carina arising near the base and gradually subsiding towards the apex; the posterior ones have sometimes a triangular foliaceous spine near the base above; the intermediate ones sometimes one, two or none. Tarsi triquetrous; first joint of the anterior pair as long as the others taken together; in the other legs it is not nearly as long as the united lengths of the remaining joints.

Total length of the body 4 in. 8 lines, antennæ $6\frac{1}{2}$, head $2\frac{1}{2}$, proth. 2, mesoth. 11, metath. 8, abdomen $27\frac{1}{2} + 5\frac{1}{2} = 33$.

Abdomen: rest of body :: 1.4042: 1.

In the specimen described, the intermediate legs when stretched straight backwards, reach to the commencement of the posterior third of the fourth abdominal segment, the posterior legs to the *cerci anales*; in other specimens the intermediate legs extend rather beyond the fourth segment, and the posterior ones beyond the extremity of the abdomen.

Hab.—Nine adult and three immature females were captured by my

private collector during the months of August, September and October last in the neighbourhood of Port Blair on South Andaman. An immature insect collected by Mr. Homfray at Camorta, Nicobar Islands, differs so slightly from larvæ, beyond doubt belonging to the present species, that I hesitate to give it another name.

BACILLUS (BACULUM) ARTEMIS, Westwood. Pl. VI. Figs. 1-2.

Bacillus? Artemis, ♀, Westwood, Cat. of Orthopterous Insects in the British Mus., 1859, Pt. I, Phasmidæ, p. 10, pl. xxvi, fig. 9, 9a.

B. patellifer, Bates, ♀, Trans. Lin. Soc. London, 1865, Vol. xxv, Pt. I, p. 328.

Numerous specimens of an insect remarkably abundant in the moist, deep valleys of Sikkim, in Cachar, in the Bhutan Doars and at Samagooting in the Naga Hills, agree in every respect both with Bates' description of *B. patellifer* and with *Bacillus? Artemis* described and figured by Prof. Westwood from a dried and mutilated example now in the Hopeian collection at Oxford. The comparison of dried specimens in my possession with Westwood's figures shows that the compression of the three terminal segments is mainly, and that the depression and enlargement posteriorly of the sixth dorsal are entirely effects of drying. Bates omits to mention that the terminal dorsal segment is grooved above in the middle line, and that the emargination in its posterior border is occupied by a small carinated azygos plate with a rounded hinder margin; the state of preservation of Prof. Westwood's specimen may probably account for his omission to mention not only these points but even the emargination itself. The following are the dimensions of a specimen from the Naga Hills figured on plate vi.

Total length 4 in. 5 lines, ant. 7 lines (25-jointed), head $2\frac{1}{2}$, proth. 2, mesoth. $10\frac{1}{2}$, metath. 8, abd. 2 in. $0\frac{1}{2}$ line + 6 = 2 in. $6\frac{1}{2}$.

A variety found in all the districts mentioned above with the exception of the Bhutan Doars is figured side by side with the typical form on the same plate as showing the value of the armature of the legs unsupported by other characters in making a species; almost every gradation from the extremely acanthophyllous and spinose condition of the legs there depicted to their almost completely unarmed condition in fig. 1 being to be met with. Fig. 2 a, 2 b, 2 c may represent the same parts of fig. 1.

BACILLUS (BACULUM) INSIGNIS, n. sp. Pl. V. Figs. 1-2.

♀ Extremely robust, greatly elongated, subcylindrical, convex. Head remarkably stout, conspicuously narrowed from the eyes to the base, the sides being almost straight, armed between the eyes with two stout-based, acuminate, forwardly-directed and incurved spines or horns, notched posteriorly in the middle. Antennæ 25-jointed; basal joint depressed, expanded, and carinated above. Mesothorax gradually attenuated from the

base forwards; metathorax of uniform width; both are marked above with a fine raised median line which is continued on to three or four of the basal segments of the abdomen.

The abdomen is attenuated from the base of its third segment to the extremity. The three terminal segments are compressed; the first of these is twice as long as the second; the second $1\frac{1}{2}$ times as long as the last which is grooved above in the middle line and has its posterior margin divided into two rounded lobes by a narrow fissure filled by the median carina of a small azygos plate; the upper contour of this last segment meets that of the preceding at a very obtuse angle. The operculum extends about one line beyond the abdomen; its posterior half is greatly compressed, so much so at its sub-truncate extremity that its opposite inner faces are in complete contact. *Cerci* minute, conical, their tips alone projecting slightly between the posterior and middle thirds of the last abdominal segment.

Legs stout, triquetrous; upper and lower crests of fore femora inconspicuously serrate towards the base; the intermediate femora are curved, their upper margin forming the convex curvature, and below at the base present two conspicuous divergent foliaceous expansions with rounded free margins, one springing from each crest and a conical spine at the apex; the posterior femora are but feebly curved and exhibit but a faint indication of these foliaceous lobes, and have also a spine at the apex below; all four posterior femora appear to be regularly tricarinate above, owing to the very close approximation of their two upper crests. The intermediate tibiæ have a large foliaceous lobe like a tooth of a saw near the base above, which is much reduced or even absent in the posterior pair; all the tibiæ have a sharp, well-developed foliaceous carina, on their basal third below, which in the fore tibiæ traverses the whole length of the joint. The first tarsal joint in the fore-legs is hardly as long as the other joints taken together; in the other legs it is not nearly as long.

The intermediate legs if stretched backwards would reach only just beyond the apex of the third, the posterior ones to the apex of the sixth abdominal segment.

Total length of body 7 in. $2\frac{1}{4}$ lines; antennæ $8\frac{1}{2}$; head $3\frac{1}{4}$; proth. $2\frac{1}{2}$; mesoth. $16\frac{1}{2}$; metath. 14; abd. $40 + 9\frac{1}{2} + \text{operc. } 1 = 50\frac{1}{2}$.

Abdomen: rest of body :: 1.3655 &c.: 1.

Hab.—Samagooting, Naga hills, Assam, (Captain Butler); Sikkim (Mr. Mandelli); and the valleys around Cherra Punji in the Khasi hills (Lieut. Bourne).

BACILLUS (BACULUM) PENTHESILEA, n. sp. Pl. V. Fig. 5.

♀ Elongate, stout, cylindrical, smooth, with a faint raised median line extending from the anterior extremity of the mesothorax nearly to tip of

the abdomen. Head not so stout as in the preceding species, armed between the eyes with two minute conical spinules or tubercles, its posterior margin presents 3 notches giving it the appearance of being bi-tuberculate, narrowed from the eyes to the base. Antennæ very slender, as long as the three terminal abdominal segments taken together, 30-jointed; first joint somewhat expanded; second minute, hardly longer than broad, followed by 28 filiform joints gradually increasing in length to the apical one. Mesothorax uniform in width except at the insertion of the legs where it is expanded. Metathorax broader than the mesothorax and expanded at each end.

Abdomen very long, attenuated from the base of the 5th segment; the three segments anterior to this are uniform in width and broadest of all, broader even than the basal segment which is just perceptibly concave at the sides; the 6th ventral has a rounded punctate callosity posteriorly; the ante-penultimate segment is as long as the two last taken together; the last is grooved above in the middle line, has its posterior angles pointed and rather deflexed than projecting outwards and its hinder margin sub-angularly emarginate, the emargination being filled by an azygos plate which is carinate, has its free margin straight and projecting beyond the acutely angular tips of the segment, and its postero-lateral angles rounded. *Cerci* tolerably salient, obtuse. Operculum subcompressed and carinate for nearly its posterior half, rounded but not compressed at the tip which barely reaches as far as the bottom of the emargination in the last segment.

Legs slender; anterior pair triquetrous; the two other pairs subtriquetrous, their upper crests being not nearly so closely approximated as in the preceding species. The intermediate legs, stretched straight backwards so as to be parallel with the long axis of the body, reach to the middle of the 4th, the posterior ones to that of the 7th segment. The anterior femora are denticulate to beyond the middle of their upper and lower crests; the four posterior pairs are devoid of spines or foliaceous lobes except at their apical ends below where there is a short denticulate elevation, all the tibiæ have a lamellar carina arising and attaining its greatest development near the proximal end; and the distal halves of the four posterior ones are acutely spinulose on all edges. The first joint of the tarsus of the fore-legs is fully as long as, of the intermediate legs shorter than, of the posterior legs almost as long as, the remaining joints together; but the first tarsal joint of 1st legs is longer and slenderer than those of the 2nd and 3rd pairs.

Colour green with the prosternum, bases of all the legs, the stigmata, the spines on the head and the interval between them, and the apex of the abdomen blackish-brown.

Total length, 6 in. $10\frac{3}{4}$ lines; antennæ, 9 lin.; head, $3\frac{1}{2}$; proth. $2\frac{1}{2}$; mesoth. $15\frac{1}{4}$; metath. $13\frac{1}{2}$; abdomen 3 in. 3 lin. + 9 lin. = 4 in.; ant. legs: femur 23 lin. + tibia 22 + tarsus $6\frac{3}{4}$ = 4 in. $3\frac{3}{4}$ lin.; inter. legs: f. $17\frac{3}{4}$ + tib.

$16 + t. 4\frac{3}{4} = 3 \text{ in. } 2\frac{1}{2} \text{ lin.}$; post. legs: f. 20 + tib. 18 + tar. 5 = 3 in. 7 lines.

Abdomen: rest of the body: : 1·3012 &c.: 1.

Hab.—A single specimen was collected in the neighbourhood of Baxa, Bhután Doár, by Dr. Cameron.

BACILLUS (BACULUM) FURCILLATUS, n. sp. Pl. V. Fig. 6.

♀ Elongate, cylindrical, smooth. Head unarmed, narrowed from the eyes to the base, with three notches on its posterior margin. Antennæ long and fine, as long as the metanotum proper, or as the two basal segments of the abdomen together, 24-jointed; first joint depressed, not greatly expanded, strongly carinate above; second longer than broad, sub-cylindrical; rest filiform. Meso- and meta-notum with a most delicate median line in relief; the former is of uniform width throughout, the latter very slightly expanded posteriorly at the origin of the legs. Abdomen shorter in proportion to the rest of the body than in the two preceding species, cylindrical to the apex of its fifth segment; whence it becomes slightly compressed and attenuated to its furcate extremity. A small azygos plate carinated above and with its posterior margin rounded, fills the bottom of the interval between the arms of the fork, which conceal its sides from view from above. The operculum is boat-shaped; its extremity which is rounded and slightly spread out horizontally, attains the level of the bottom of the fork only.

The legs closely resemble those of *B. Penthesilea*, but the four posterior femora have some widely-placed spinules on both their inferior crests; the intermediate ones reach to the end of the basal third of the 5th, the posterior extend slight beyond the terminal abdominal segment.

Total length 5 in. $1\frac{1}{2}$ lin.: antennæ 8; head 3; proth. $2\frac{1}{2}$; mesoth. $12\frac{1}{2}$; metath. 10; abd. $27\frac{1}{2} + 6\frac{1}{4} = 33\frac{3}{4}$; ant. legs, 3 in. 7 lin.; inter. legs 2 in. 6 lin.; post. legs 2 in. 11 lin. Colour uniform green.

The abdomen: rest of body: : 1·2162 &c.: 1.

Hab.—Baxa, Bhután Doár, collected by Dr. Cameron.

This species is at once distinguished from the two preceding, as indeed these are from one another, by the difference in the structure of the terminal dorsal segment; by the form of the operculum, by the relative length of the abdomen to that of the body, and by the absence of spines from the head.

In the four preceding species to which M. de Saussure's subgeneric term *Baculum* may be provisionally applied, the last dorsal segment of the abdomen is mesially grooved above; the line of structural weakness thus produced, may possibly subserve the purpose of giving greater expansibility to the segment during copulation and oviposition. This peculiarity of structure is present also in *Bacillus (Baculum) Cuniculus*, Westwood, in *B. (B.) Hyphæreon*, Westwood, and in *B. (B.)*

scytale, Bates, if one may judge from the published figures of those species. With regard to the last mentioned, it should be noted that Mr. Bates, although he states its affinities to be with the first, at the same time refers it to a totally distinct subgeneric group, *viz.*, to *Ramulus*, de Sauss., in which the abdomen is fusiform and acuminate at the extremity. It is also to be remarked that the species to which *B. scytale* is said to be so nearly related by Bates has turned out not to be a *Bacillus* at all, but a *Lonchodes* very closely allied indeed to *L. pseudoporus*, Westw., if not identical with that species. *Ramulus* is, however, still retained by M. de Saussure for a group of the *Bacilli*, under which *B. humilis*, Westw., *B. carinulatus*, Sauss., &c., have been arranged.

BACILLUS SCABRIUSCULUS, n. sp. Pl. VII. Fig. 1.

Very robust. The integument is wrinkled and studded with granulations and small tubercles. Head thick, coarsely granulated, very little narrowed behind, armed between the eyes with two conical spines, projecting outwards and slightly backwards and with their bases united by a transverse elevation, bi-tuberculate posteriorly. Antennæ as long as the metathorax, 18-jointed, ciliated; the first is depressed and expanded, and strongly carinated; the second joint is about half the length of the first, twice as long as broad and depressed; the rest are slenderer than it and filiform. Prothorax narrower in front, with its anterior margin hollowed for the reception of the head, covered with coarse granules. Meso- and meta-notum irregularly wrinkled longitudinally and covered with small tubercles or coarse granules, marked with a raised median line; the former gradually widens from the apex to the insertion of the intermediate legs; the latter is broader and of uniform width, and a distinct suture divides it into an anterior posterior division (the true 1st abdominal segment = *segment mediare*). Below, the granulations and wrinkles are finer. The abdomen is cylindrical to the fifth or sixth segment, whence it becomes suddenly contracted and compressed, but expands again slightly at the apex which is furcate; the bottom of the fork is occupied by a small carinated azygos plate. The upper contour of the three terminal dorsal segments is extremely convex and the posterior margin of the first two of them is produced into a small process. The operculum is lanceolate in outline as seen from below, its posterior half is carinate and its apex barely reaches the level of the minute *cerci*.

Legs long; anterior pair triquetrous, the rest prismatic; anterior femora serrated to the middle of the upper crest; the intermediate ones are armed with three conspicuous dentate foliaceous lobes above and with three small spines on the other crest, one opposite to each of the foliaceous lobes; the posterior femora have some small spines on each of their upper crests. The

intermediate tibiæ have each two small foliaceous lobes above at the proximal end and immediately opposite to these, below, a single spine; at their distal ends all their edges are spinulose; the posterior tibiæ have two minute spines above at the proximal end and their distal ends are similarly spinulose. All the legs are shortly-ciliate, especially at the extremities.

Total length 4 in. $1\frac{1}{2}$ lines; antennæ $7\frac{1}{2}$; head $3\frac{1}{2}$; proth. $2\frac{1}{2}$, mesoth. $10\frac{1}{4}$; metath. $7\frac{1}{4}$; abdomen $18\frac{1}{2} + 7 = 25\frac{1}{2}$ lines.

Hab.—Naga Hills, Assam. A single specimen was collected by Captain Butler.

Explanation of Plates.

Plate V.

Fig. 1. *Bacillus (Buculum) insignis*, ♀, nat. size. 1a, the head seen sideways; 1b, the extremity of the abdomen seen sideways.

Fig. 2. Upper view of terminal abdominal segment of *B. insignis*, ♀, enlarged.

Fig. 3. *B. oxytenes*, ♀, nat. size; 2a, extremity of the abdomen from the side.

Fig. 4. *Facillus lævigatus*, ♀, nat. size; 4a, b, c, represent same parts as in the previous figures.

Fig. 5. Upper view of terminal abdomen segment of *B. Penthesilea* ♀, enlarged; 5a, side-view of three terminal segments, nat. size.

Fig. 6. *B. furcillatus*, ♀, terminal segment of the abdomen from above, enlarged; 6a, the three terminal segments nat. size seen sideways.

Fig. 7. *B. fuscolineatus*, ♂, nat. size; 7a, the three terminal segments of the body seen from above; 7b, the same seen from the side.

Plate VI.

Fig. 1. *Bacillus Artemis*, Westw. ♀, nat. size.

Fig. 2. *Bacillus Artemis*, Westwood ♀, var. nat. size; 2a, the three terminal segments seen from the side; 2b, the terminal segment, $\times 2$ from above, 2c, the extremity of the abdomen from below, 2d, basal joint of antennæ magnified.

Fig. 3. *B. Westwoodii*; ♀, nat. size; 3a, side view of three terminal segments of abdomen; 3b, the same from below.

Plate VII.

Fig. 1. *Bacillus scabriusculus*, ♀; nat. size; 1a, the three terminal segments of the abdomen from the side.

Fig. 2. *Bacillus hispidulus*, ♂, nat. size; 2a, the terminal segments of the abdomen seen sideways; 2b, the same seen from above; 2c, the same from beneath.

Fig. 3. *Bacillus hispidulus*, ♀, nat. size; 3a, 3b, 3c, represent same parts as in fig. 2.

ON AN UNDESCRIBED SPECIES OF *LOPHOPHANES*, by W. E. BROOKS, C. E.,
Assensole.

[Received 11th February, 1873 ; read 5th March, 1873.]

LOPHOPHANES HUMEL, n. sp.

Description. Head and crest, neck, chin and throat, bluish black ; the black of the throat extends about 0·6 of an inch from base of lower mandible ; cheeks and ear coverts, and sides of the neck beyond ear coverts, form a patch of pure white ; there is also a large patch of pure white on the back of the neck ; on the sides of the neck below the white patch the black extends about $\frac{1}{4}$ of an inch lower down than it does on the centre of the breast ; back and wing coverts dark bluish grey, becoming paler and more ash coloured on the upper tail coverts ; lesser and greater wing coverts tipped with bright white ; wings and tail dusky, the feathers having paler edges ; wing lining, axillaries and breast a clear ochre passing to a dusky yellow grey on the flanks, lower abdomen, and under tail coverts. This fulvous lower surface is characteristic of the species. Bill black ; legs and feet dusky.

Total length judging from the skins, will be about 4 inches.

No.	Length of skin.	Wing.	Tail.	Bill at front.	Tarsus.	Midtoe and claw.	Hindtoe and claw.
1—	3·7	2·25	1·76	·32	·68	·5	·48
2—	3·5	2·12	1·73	·3	·66	·5	·5

This species strikingly resembles in colouration the plate of *Parus Britannicus*, Sharpe and Dresser, in their fine work on the Birds of Europe ; except that it is almost devoid of the greenish tint of the upper parts shewn in the plate, and our species is not a typical *Parus*, but a crested *Lophophanes*. It is also rather like Hodgson's drawing of *Parus oemodius* ; but that species is not shewn to be crested, neither has it any white spots on the wings.

I picked this species out of a collection of Sikkim birds, sent by Mr. Mandelli to Mr. Ball. The discoverer allows me to describe it, and I have, therefore, great pleasure in naming it after my friend Mr. Hume, as I cannot remember any species named after the most laborious of our present Indian Ornithologists.

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Part II.—PHYSICAL SCIENCE.

No. II.—1873.

NEW BURMESE PLANTS. PART II,—by S. KURZ, Esq.

[Received 15th Feb., read 5th March, 1873.]

[With plates VIII, IX, X.]

TERNSTROEMACEÆ.

106. *ANNESLEA MONTICOLA*, nov. sp.

Arbor 80-90 pedalis v. in regionibus altioribus pumila, glaberrima; folia c. 3 (arboris juvenilis usque ad 7) poll. longa, ovato-oblonga, raro lanceolata, basi rotundata v. obtusa et subdecurrentia, breve lateque petiolata, acuminata v. acuta, integra v. obsolete crenata, crassissime coriacea, nervis vix visibilibus, subtus (in sicco) atropunctata; flores majusculi, basi bibracteolati, pedicellis 2, sub fructu usque 3 poll. longis crassis albis ramulos terminantibus; calyx coriaceus, albus; corolla rosea. *Martaban*.—A. crassipedi arcte affinis, pedunculis et foliis acutis distinguitur.

107. *SAURAUJA ARMATA*, nov. sp.

Arbor 25-30 pedalis, novellis squamis adpressis firmis subosseis acutissimis vestita; folia 9-10 pollicaria, lato-ovata ad obovato-oblonga, acuta, basi obtusa, brevissime petiolata (petiolis crassis squamatis), spinescenti serrata, chartacea, glabra, sed subtus secus costam nervosque squamis subosseis adpressis adspersa; flores $1\frac{1}{2}$ poll. fere in diametro, in pedunculis brevissimis crassis dense squamatis solitarii, vulgo supra foliorum delapsorum cicatricibus fasciculati; sepala tomento squamis rigidis adpressis intermixto obducta; ovarium unacum parte unita styliorum 5 dense villosum.—*Martaban*.

108. SAURAUJA MACROTRICHA, nov. sp.

Partes omnes (superficie foliorum excepta) pilis longis rigidis ferrugineis v. nigrescentibus vestitæ; folia fere pedem longa v. breviora, lanceolata, utrinque attenuata, breviuscule petiolata (petiolis hirsutis), acuminatissima, setaceo-serrata, chartacea, supra glabra, subtus inprimis secus nervos venulosque rigide hirsuta; flores parvi, longe graciliterque pedicellati, in axillis foliorum v. supra eorum cicatricibus cymas hirsutas formantes; bracteæ parvæ, lineari-lanceolatæ, glabræ; sepala et ovarium glabra; styli 5, erecti, basi uniti.—*Ava.* (J. Anderson.)

109. PYRENARIA DIOSPYRICARPA, nov. sp.

Arbuscula novellis tomentellis; folia 4-5 poll. longa, oblongo-v. elliptico-lanceolata, basi acuta et marginibus ut plurimum involutis, breve petiolata (petiolis crassis dense tomentosis), obtusa v. subobtusa, coriacea, juniora utrinque, denuo subtus tantum dense tomentella v. pubescentia, flavescenti viridia, in sicco more *Symploci* lutescentia; flores mediocres, brevissime et crasse pedicellati, solitarii, axillares; bracteæ sepalis longiores, foliaceæ, oblongo-lanceolatæ, basin versus attenuatæ et cum basi latissima sessiles; sepala bracteis conformia, sed minora et gradatim in petala extus dense sericea abeuntia; ovarium dense sericeo-villosum; styli 5, apice liberi, crassi et breves; drupæ pomiformes, 2 poll. circiter longæ, obovato-oblongæ, obsolete obtuseque 3-4-angulares, carnosæ, lævissimæ et cerino-luteæ, nitentes, basi *Diospyrorum* more bracteis sepalisque paullulo accretis sustentæ.—*Martaban.*

DIPTEROCARPEÆ.

110. SHOREA FLORIBUNDA (*Hopea floribunda*, Wall. Cat. 964).

Arbor verosimiliter decidua, glaberrima; folia juniora oblonga ad elliptica, basi rotundata, petiolis mediocribus gracilibus suffulta, acuta, glabra; flores mediocres, subsessiles, racemosi, in paniculas glaberrimas in axillis foliorum novellorum dispositi; calycis lævissimi lobi 2 interiores paullo breviores; petala semipollicem fere longa, lutescentia?, lanceolata, extus parce pubescentia; stamina c. 15, connectivo in aristam reflexam antheræ longitudine terminato.—*Tenasserim.* (Wall.).

111. HOPEA GRIFFITHII, nov. sp.

Glabra; folia ovato-lanceolata, breviuscule sed gracilius petiolata, basi acuta, longe et obtusiuscule caudato-acuminata, coriacea, subtus subnitentia et costa acute prominente percursa, nervis autem lateralibus 12-10 utrinque subtilibus; flores minimi, subsessiles, secundi, flexuoso racemosi, paniculam glabram brevem sed gracillimam formantes; calyx glaber, lobis lato-rotundatis et obtusis; petala extus velutina, lineam circiter longa; antheræ breves arista rigida antheræ longitudine v. longiore terminatæ.—*Tenasserim* (Helf. 717).

H. jucundæ, Thw. arcte affinis a qua autem foliorum nervatione valde diversa jam dudum recognoscenda.

112. *HOPEA GRATISSIMA*, Wall. Cat. 960.

Glabra; folia lato-lanceolata, graciliter petiolata, basi acuta, breve et obtusiuscule apiculata, coriacea, supra lucida, nervis 15-16 utrinque subparallelis unacum costa acute prominentibus: flores secundi, breve pedicellati, racemos compositas terminales axillaresque parce puberulos formantes; calyx velutinus, lobis lanceolatis obtusis; petala extus velutina, 2 lin. longa; connectivum arista longa flexuosa terminatum.—*Tenasserim*. *H. diversifoliæ*, Miq., quam maxime affinis, an synonyma?

113. *ANISOPTERA GLABRA*, nov. sp.

Arbor ingens, 100-120 pedalis, glabra; folia circ. 5 poll. longa, elliptica ad oblonga, raro obovato-oblonga, breve acuminata, basi rotundata v. obtusa, coriacea, utrinque glabra, nervis subtus valde prominentibus; petiol. 1—1½ poll. longi, glabri; racemorum pedunculi ferrugineo-tomentosi, glabrescentes; flores desunt; calycis tubus fructigerus glaber, nuci tomentosæ fere ad 2/3 part. adnatus; calycis laciniae inequales, quarum 2 longiores c. 6 pollicares, lineari-lanceolatae, obtusæ, basin versus sensim attenuatae, conspicue 3-costatae et transverse venosæ, glabrae (costis minute tomentosis exceptis); interiores 3 strictæ, erectæ, lineari-lanceolatae, pollicem fere longæ acuminatae, basin versus latiores; nux velutina stylo longo acuminata.—*Martaban*. *A marginatæ*, Korth., cui *Shoream Penangianam*, Wall. Cat. 963, synonymam adscriberem, affinis.

MALVACEÆ.

114. *BOMBAX INSIGNIS*, Wall. Pl. As. rar. I. 71. t. 79-80.

Species haud cum *B. Malabarica* conjungenda, sed inter alia staminibus bene distinguitur:

B. Malabarica: staminum phalanges e filamentis crassis 15-20; *B. insignis*, autem e filamentis 50 pluribusve filiformibus compositæ.

STERCULIACEÆ.

115. *HERITIERA MACROPHYLLA*, Wall. MS.

Arbor, omnibus partibus argenteo-lepidotis; folia magna, ovato-oblonga v. oblonga, petiolis parce lepidotis 2-4 poll. longis v. raro brevioribus, basi rotundata et sæpius leviter sinuata, 7-12 poll. longa, acuta v. breve acuminata, coriacea, supra glabra, subtus argenteo-lepidota; flores parvi, dense fulvo-puberuli, 5-raro 7-denticulata, breve pedicellati paniculas axillares amplas ramosas dense fulvo-puberulos formantes; carpella lignosa, suboblique ovalia, canescenti-lepidota et pustulis suberosis rugoso-scabra, facie interna conspicue, extus obsolete carinata, apice in appendicem longiusculum coriaceum

alæformem producta.—*Martaban*. N. B. *H. attenuata*, Wall., Cat. 1140; Horsf. et Benn. H. Jav. rar. 237, a me non visa, vix hujus generis sed probabiliter cum *Brownlowia lanceolata*, Bth., comparanda.

116. *HELICTERES OBTUSA*, Wall. Cat. 1184.

Fruticulus partibus omnibus fulvo-tomentellis; folia oblonga ad oblongo-lanceolata, brevissime petiolata, basi obtusa v. rotundata ibidemque 3-nervia, 2-2½ poll. longa, in eademque stirpe obtusa v. acuta et vulgo mucronata, chartacea, integra, supra pilis brevibus stellatis adspersa, subtus fulvescenti stellato-tomentella; flores parvi, breve pedicellati; cymæ fulvo-tomentellæ, brevissimæ, axillares, paucifloræ, graciles; calyx circ. 2 lin. longus, stellato-tomentellus et subfurfuraceus; petala sublongiora; staminum columna glabra; capsulæ oblongæ, breves, circ. 7-8 lin. longæ, dense villosomuricatae, carpellis inter se arcte coherentibus obtusis v. subobtusis.—*Martaban, Tenasserim*. *H. lanceolata*, DC. (= *H. virgata*, Wall.) affinis.

117. *PTEROSPERMUM ACEROIDES*, Wall. Cat. 1171.

Arbor, novellis dense tomentosis; folia elliptica v. lato-oblonga, ut plurimum subobliqua, arboris junioris palmato-5-7-loba, breviuscule petiolata, profunde et saepius inaequali-cordata, verosimiliter nunquam peltata, breve acuminata v. apiculata, supra glabra, subtus canescenti v. fulvescenti-tomentosa, basi 5-7-nervia; stipulæ...; flores magni, albi, breve crasseque pedicellati, 3-v. 2-ni axillares et subcymosi; bracteolæ oblongo-lanceolatae, tomentosæ, integræ; calyx 2-3 poll. longus, sepala crassissime coriacea, linearia, ferrugineo-tomentosa, extus striata, intus fulvo-stellato pubescentia; stylus glaber; ovarium fulvescenti-tomentosum; capsulæ 5-angulares, oblongæ.—*Tenasserim, Andamans*.

TILIACEÆ.

118. *BERRYA MOLLIS*, Wall. Cat. 1186.

Arbor magna, novellis tomentellis; folia cordato-rotundata, lata, circ. 6-7 poll. longa et lata, basi palmato-7-9-nervia, petiolata, petiolis 4-5 poll. longis dense puberulis v. tomentellis, obtusiuscula v. acuta, obsolete repanda et in lobos 2-3 breves obtusos producta, chartacea, adulta supra (nervis pubescentibus exceptis) glabra, subtus dense puberula v. subtomentosa; flores c. 4-5 lin. in diametro, albi, paniculas laxas fulvo-tomentosas terminales formantes; pedicelli longi, tomentosi; calyx extus dense tomentosus, profunde 2-3-fidus, in alabastro subglobosus; petala obovato-lanceolata, calyce longiora; stamina numerosissima et conferta; stylus simplex, glaber; ovarium villosum; capsulæ unacum alis oblique oblongis nervosis c. 2-2½ poll. in diametro, tomentellæ, siccæ, brunneæ; semina globosa.—*Pegu, Martaban*.

119. GREWIA SCABRIDA, Wall. Cat. 1113 (pro parte).

Frutex ? novellis ferrugineo-tomentellis ; folia oblonga v. ovato-lanceolata, 5-6 poll. longa, petiolis brevibus ferrugineo-tomentosis, basi obtusa v. rotundata, serrata, acuminata, chartacea, utrinque (præsertim subtus) stellato-hirta et scabra, 3-nervia, venis transversis valde conspicuis ; flores circ. 8-10 lin. longi, pedicellis sulcatis ferrugineo-tomentosis et subfurfuraceis, 2-3-ni cymas parvas ferrugineo-tomentosas axillares formantes ; sepala 7-8 lin. longa, lineari-lanceolata, extus scabriuscule ferrugineo-tomentella ; petala circ. 2 lin. longa, lamina oblongo-lanceolata obtusa et a foveolâ latâ crassâ dense fulvo-villosâ usque ad basin fere separabilis ; gynophorum et ovarium fulvo-villosa ; drupæ profunde 4-lobæ, sed sæpe loborum unus alterve abortivus, lobis obtusis et divergentibus parce hispidis glabrescentibus, pollicem fere in diametro ; mesocarpium fibrosum, coccis monospermis.—*Martaban, Tenasserim.* Species *G. odoratæ*, Bl. (*G. umbellata*, Roxb.) et *G. columnari*, Sm. valde affinis, sub eodem nomine cum *G. pilosa*, Lamk., a cl. Wallichio distributa indeque a Wightio et Arnotto cum eadem confusa. *G. retusifolia*, Kurz in hocce diario, 1872, p. 294 proposita, foliis profunde retusis in sinu mucronatis insignis, teste cl. Mastersio ad *G. humilem*, Wall., speciem nondum descriptam, pertinet.

120. GREWIA MICROSTEMMA, Wall. ap. Voigt. Cat. Hort. Suburb. Calcutt. 128.

Frutex novellis scabro-puberulis ; folia oblonga v. ovato-lanceolata, basi inequali-rotundata, brevissime petiolata, 5-7 poll. longa, acuminata, duplicato-serrato-dentata, chartacea, utrinque (præsertim subtus) scabro-puberula, 3-nervia, cum nervo adjecto ad latus latius ; stipulæ petiolis fulvo-tomentosis longiores, subulatæ, strictæ, scabro-puberulæ ; flores parvi ; pedicelli tomentosi, breves ; cymæ multifloræ brevissime pedunculatæ 2-3-næ axillares ; sepala circ. 2 lin. longa, fulvo-puberula ; petala lineari-lanceolata, 1 lin. longa, longitudine foveolæ ovalis villosa-ciliatæ incrassatæ, dorso linea hirsuta notata ; stamina in floribus masculis 16 ; ovarium hirsutum ; drupæ...—*Pegu.*

121. COLUMBIA FLORIBUNDA, (*Grewia floribunda*, Wall. ap. Voigt. Cat. Hort. Suburb. Calc. 128 ; *Glossospermum* ? 5-alatum, Wall. Cat. 1154 et 7841).

Frutex scabro-stellato-hirtellus ; folia rotundata v. lato-obovato-oblonga, basi vulgo cordata, petiolis longiusculis gracilibus scabris, acuta v. breve acuminata v. obtusa, apicem versus sæpius in lobos 2 v. unicum obtusum v. truncatum raro acutum producta, distanter dentata, basi vulgo 7-nervia, membranacea, supra stellato-scaberrima, subtus plus minus pilis stellatis puberula et mox scabrescentia ; flores parvi, pedicellis gracilibus brevibus

tomentellis, in cymulas pedunculatas dispositi et paniculam terminalem laxam canescenti-puberulam efficientes; sepala lineam circiter longa, extus canescenti-tomentella; petala obovato-oblonga, obtusa, sepalis subæquilonga, basi foveola minuta incrassata villosa-ciliata aucta; capsulæ 7-9 lin. in diametro, stellato-puberulæ, scabræ, siccæ, maturæ in carpidia 3-4 indehiscentia monosperma bialata separantes.—*Ava, Martaban.*

122. *EVODIA VITICINA*, Wall. Cat. 1219.

Frutex? glaber, ramulis lineis 4 acute prominentibus notatis; folia 3-v. uni-foliolata in eodem v. diversis ramulis, opposita, glabra, petiolis $\frac{1}{2}$ — $\frac{3}{4}$ poll. leviter alatis; foliola 2-3 $\frac{1}{2}$ poll. longa, lanceolata v. obovato-lanceolata, basi attenuata et subsessilia, membranacea, breve acuminata, subtus pallida; paniculæ contractæ et parvæ, puberulæ, petiolis v. multo breviores v. subæquilongæ; flores parvi, brevissime pedicellati; petala 4, lineari-oblonga, obtusa, subcoriacea; carpella....—*Tenasserim.*

123. *LIMONIA ALTERNIFOLIA*, Wall. ap. Voigt. Hort. Calcutt. 139.

Fruticulus gracilis, simplex v. parce ramosus, deciduus, inermis, glaber-rimus; folia impari-pinnata, rachide anguste alata; foliola 5-7-juga cum impari, alterna, subsessilia, oblongo-lanceolata ad lanceolata, oblique acuminata, crenata, glabra, 1-1 $\frac{1}{2}$ poll. longa, pellucido-punctata; flores pentameri, parvi, albi, e ramulis novellis axillaribus brevibus orientes et cymam brevem glabram breve pedunculatam v. subsessilem efformantes; calycis lobi trigono-oblongi, acuta, $\frac{1}{2}$ lin. longi; petala 3 lin. longa, acutiuscula; stamina 10, alternatim breviora, filamenta basi intus parce puberula; ovarium obovatum, compressiusculum, læve, toro brevi crasso insidens, 2-loculare, loculis ovulo solitario pendulo; stylus curvus, stigmate incrassato; torus post præflorationem productus; baccæ....—*Pegu.*

SIMARUBEÆ.

124. *BRUCEA MOLLIS*, Wall. MS.

Fruticulus simplex v. subsimplex, 2-3 pedalis, novellis puberulis v. pubescentibus; folia imparipinnata, petiolus rachisque teres puberuli, glabrescentes; foliola 4-6-juga cum impari, ovato-oblonga v. ovato-lanceolata, longiuscule petiolulata, acuminata, integerrima, membranacea, supra sparse, subtus densius, pubescentia v. præter nervos pubescentes glabra, 2-3 poll. longa; flores minuti, graciliter pedicellati, racemos puberulos v. pubescentes simplices graciles folio multo breviores axillares formantes; drupæ solitariae v. binæ, rarius ternæ, ovatæ, pisi majoris magnitudine v. majores.—*Martaban.* *Brucea* genus magis ad *Tapiriam* inter *Anacardiaceas* spectat.

MELIACEÆ.

125. *CHICKRASSIA VELUTINA*, (Swietenia velutina et S. villosa, Wall. Cat.).

Species mihi bona, a Ch. tabulari distinguitur novellis, foliis etc. molli-ter pubescentibus, foliolis numerosioribus supra velutinis subtus molliter pubescentibus; paniculis ferrugineo-tomentosis; floribus majoribus; petalis obovato-oblongis 5-6 lin. longis; calyce dense fulvo-tomentoso; capsulis atris, sublævibus.—*Pegu*, etc.

CELASTRINEÆ.

126. *MICROTROPIS LONGIFOLIA*, Wall. Cat. 4339 (pro parte).

Frutex? glaber; folia oblongo-lanceolata v. oblonga, petiolis crassis 4-5 lin. longis, breve acuminata, basi acuta, 6-7 poll. longa, integra, coriacea, utrinque (præsertim supra) rugulosa, opaca; flores breve cymosi; pedunculus 4-6 lin. longus; capsulæ obovatæ; testa seminis rubra.—*Tenasserim*. *G. latifolia*, Gais., in Hb. Kew assimilis, nervatione autem diversa.

AMPELIDEÆ.

127. *LEEÆ COMPACTIFLORA*, nov. sp.

Arbuscula *L. sambucinæ* valde affinis, sed foliola angustiora, argute serrato-dentata, longe acuminata; inflorescentia petiolo multo brevior, ferrugineo-tomentosa; flores viridiusculi, sessiles, bracteis latis brevibus ovatis acutis subscariosis circumdati et in glomerulos compactos congesti; fructus non adsunt.—*Martaban*.

128. *LEEÆ GIGANTEA*, Griff. Not. Dicot. 697. t. 645, f. 3.

Frutex simplex, elatus, glaberrimus; folia largissima, supra-decomposita, petiolus compressiusculus lævis; foliola vulgo magna, 6-8 poll. longa, petiolulis $\frac{1}{2}$ (terminali usque ad 2) poll. longis, oblonga ad oblongo-lanceolata, breve et abrupte acuminata, basi acuta, grosse crenato-serrata, tenui-coriacea, glaberrima, lucida, siccando nigrescentia, nervis subtus prominentibus; flores parviusculi, virescenti-albidi, pedicellis brevissimis robustis v. subsessiles, in cymam amplam diffusam 2-3-chotomice ramosam glaberrimam axillarem v. subterminalem petiolorum longitudine v. longiorem dispositi; bracteæ bracteolæque ante anthesin caducissimæ; calycis lobi breves, rotundati v. subacuti, glabri; petala reflexa, lineam circiter longa; lobi tubi staminum triangulari-lanceolati, acuminati, apice integro reflexi; baccæ depresso-globosæ, 4-6 spermæ; semina obtuse carinata, lateribus tuberculato-costatis.—*Tenasserim*.

129. *LEEÆ LÆTA*, Wall. Cat. 6831.

Frutex humilis, 2-3 pedalis, glaber; folia bipinnata, petiolis teretibus; foliola petiolulis 1-2 lin. longis, oblongo-ad ovato-lanceolata, 5-8 poll. longa,

basi rotundata subinequalia, acuminata, crenato-serrata, membranacea, glabra siccando magis minusve rubescentia; flores parvi, rubri, pedicellis brevibus tomentosis, cymas compositas breves sessiles v. pedunculatas compactiusculas v. raro diffusas axillares efficientes; bracteæ bracteolæque ante anthesin caducæ; calycis lobi triangulares, acuti, glabri; petala lineam fere longa; tubi staminei lobi emarginati; baccæ desunt.—*Burma, Andamans.*

130. *LEEAE SANGUINEA*, Wall. ap. Voigt. Cat. Suburb. Calcutt. 30.

Herba perennis, caulibus crassis teretiusculis, glabra; folia inferiora decomposita, superiora impari-pinnata, summa sæpius ternata, petiolis, petioulis rachique anguste membranaceo-4-alatis; foliola vulgo 3-juga cum impari, elliptico-oblonga ad oblongo-lanceolata, terminali longius petiolulato sæpius ovato-oblongo, brevissime petiolulata v. subsessilia, 6-8 poll. longa, acuta, argute serrata, glabra, nervis parallelis venisque transversis subtus valde prominentibus; cymæ vulgo a basi ramosæ v. pedunculatæ, trichotomo-ramosæ, pedunculis et ramificationibus purpurascensibus compresso-angulatis glabris; bracteæ, bracteolæque ante anthesin deciduæ; flores parvi, coccinei, pedicellis brevibus crassis glabris suffulti; calyx 5-dentatus, coccineus, lobis acutis; petala coccinea, lineam circiter longa; tubus stamineus cerino-albus, lobis emarginatis; filamenta subpurpurascens; baccæ depresso-globosæ, pisi magnitudinis, vulgo 6-spermæ, aurantiacæ.—*Ava.*

N. B.—*Vitis Wallichii*, Kurz in hocce diario 1872, p. 302 (*Leea cordata*, Wall. Cat. 6819) ad *V. Linnæi* formas probabiliter reducenda, a quibus autem cymis axillaribus (nec oppositifoliis) differre videtur.

ANACARDIACEÆ.

131. *MANGIFERA CALONEURA*, nov. sp.

Arbor mediocris, glabra; folia oblonga ad oblongo-lanceolata, 3-5 pollicaria, petiolo basi valde incrassato 1-½ poll. suffulta, obtuse acuminata, coriacea, glabra, utrinque elegantissime minute et prominenter reticulata, costâ crassa lata præsertim supra prominente et subplana percursa, nervis lateralibus vix curvis 18-20, tenuibus; flores parvi, sessiles v. subsessiles paniculam terminalem tomentosam amplam formantes; calyx pubescens; petala lanceolata, acuta, reflexa, lineam circiter longa, ciliolata, alba, medio linea citrina percursa; stamen 1, anthera atropurpurea; discus 5-lobus, lævis; drupæ ovi gallinacei magnitudine subreniformi-ovoideæ, læves, obtusæ, aurantiacæ v. luteæ, acido-dulces, subteretes.—*Pegu, Martaban.* M. Indicæ affinis, reticulatione elegantissima statim recognoscenda.

N. B.—*Bouea Brandisiana*, Kurz in Journ. As. Soc. 1871, p. 50, ad B. Burmanicam, Griff. in hocce diario, 1854, p. 634, referenda.

*LEGUMINOSÆ.*132. *MILLETTIA MONTICOLA*, nov. sp.

Frutex alte scandens, deciduus, novellis parce ferrugineo-pubescentibus glabrescentibus, ramis verrucosis; folia novella (adulta non visa) imparipinnata; foliola 4-3-juga cum impari, petiolulata, oblonga, breve acuminata, subtus secus nervos adpresse fulvo-pubescentia; flores azurei, parviusculi, pedicello 1-2 lin. longo ferrugineo-tomentoso suffulti, fasciculati, in racemos simplices solitarios ferrugineo-tomentellos 4-7 pollicares supra foliorum delapsorum cicatricibus orientes dispositi; calyx parce ferrugineo-tomentosus, 2-2½ lin. longus, longior quam latus, obsolete et lato-dentatus, denticulo anteriore paullo producto; corolla glabra, vexillo circiter semipollicari; ovarium tenuiter ferrugineo-pubescentia; legumina desunt.—*Martaban*. *M. pachycarpæ*, Bth., arcte affinis.

133. *MILLETTIA LEOGYNA*, nov. sp.

Frutex deciduus alte scandens novellis ferrugineo-tomentosis; ramis teretibus minute lenticellatis; folia novella (adulta desunt) ferrugineo-tomentosa, imparipinnata; foliola 4-6-juga cum impari; flores majusculi, violacei, vexillo in fundo luteo, pedicellis 2-3 lin. longis nutantibus velutinis suffulti, racemos 4-5 pollicares fulvo-tomentosos e ramulis abbreviatis lateralibus ortos formantes et sæpius in paniculam amplam lateralem collecti; calyx latior quam longus, 2-2½ lin. longus, fulvo-velutinus, obsolete dentatus, dente anteriore paullo producto; corolla glabra, vexillum ½ poll. longum, emarginatum; ovarium læve; legumina juniora linearia, læves, subulato-acuminata.—*Martaban*. *M. extensæ*, Bth., affinis.

134. *MILLETTIA GLAUDESCENS*, nov. sp.

Arbor magna, decidua, glabra v. sæpius novellis parce pubescentibus; folia imparipinnata, ½-1 ped. longa, glabra, v. rachi et petiolulis parce puberulis; folia elliptica ad obovato-oblonga et oblongo-lanceolata, vulgo 3-4-raro 2-juga cum impari, obtusiuscule et subabrupte acuminata v. apiculata, petiolulis 2-3 lin. longis gracilibus glabrescentibus, integra, 3-4 poll. longa, membranacea, glabra v. subtus secus costam subpubescentia, subtus glaucescentia; flores parviusculi, cyanei, pedicellis capillaribus puberulis v. subglabris 3-4 lin. longis, in racemos graciles glabros v. puberulos solitarios v. secus ramulos novellos aphyllis aggregatos dispositi; calyx latior quam longus, parce pubescens, 1-1½ lin. longus, obsolete lato-dentatus; corolla glabra; vexillum obsolete emarginatum, ½ poll. fere longum; ovarium adpresse sericeum; legumen oblongum, basi attenuatum, lignosum, incurvato-acutum, planum, suturis in alas angustissimas dilatatis undequæ quasi subquadrangulare-alatum, glabrum, lenticellis rimosis sparse obtectum, 3-4 poll. longum, 2-3 lin. crassum, 1-3-spermum.—*Pegu, Martaban*.

135. *MILLETTIA PUBINERVIS*, nov. sp.

Arbuscula 20-25 pedalis, novellis puberulis; folia impari-pinnata, c. $\frac{1}{2}$ ped. longa, rachi puberula; foliola elliptico- ad obovato-oblonga, petiolulis gracilibus 1-2 lin. longis puberulis, longiuscule et obtusiuscule acuminata, 2-3 poll. longa, tenuiter chartacea, integra, subtus glauca et secus costam pubescentia; flores parviusculi, luride lutescenti albi, pedicellis capillaribus pubescentibus, solitarii v. fasciculati, racemos solitarios oppositifolios graciles luteolo-pubescentes $2\frac{1}{2}$ -3 poll. longos formantes; calyx rubicundus, latior quam longus, circ. $1-1\frac{1}{2}$ lin. longus, parce pubescens, obsolete sinuato-dentatus; corolla glabra; vexillum plus quam $\frac{1}{2}$ poll. longus; ovarium adpresse pubescens; legumen deest.—*Martaban.*

136. *MILLETTIA LEUCANTHA*, nov. sp.

Arbor mediocris, novellis sericeo-pubescentibus glabrescentibus; folia impari-pinnata, $\frac{1}{2}$ - $\frac{3}{4}$ ped. longa, juniora subtus sparse pubescentia, mox glabrescentia; stipellæ subulatæ, rigidæ, diutius persistentes; foliola ovata ad elliptica, ut plurimum 3-juga cum impari, longius petiolulato, breve et subabrupte acuminata, petiolulis c. 2 lin. longis puberulis glabrescentibus, 3-4 poll. longa, rigide chartacea, adulta glaberrima, integra, subtus sæpius pallida; flores fasciculati majusculi, candidi, pedicellis 2-3 lin. longis cinereo-velutinis; racemi solitarii, cinerascens pubescentes, erectiusculi, 2-4 poll. longi, in ramulis lateralibus terminales v. laterales; calyx canescenti-velutinus, c. $2\frac{1}{2}$ lin. longus, dentibus 3 inferioribus distinctis, acutiusculis, 2 superioribus connatis lato-ovatis; corolla glabra; vexillum $\frac{1}{2}$ poll. fere longum, integrum; ovarium adpresse sericeum; legumen lignosum, oblongum ad obovato-oblongum, acutum, glabrum, lenticillato-scabrum, $1\frac{1}{2}$ -3 poll. longum, marginibus uti in *Pongamia* obtusis, 1-3 spermum; semina plana, brunnea.—*Prome, Pegu.*

137. *MILLETTIA OVALIFOLIA*, (*Pongamia ovalifolia*, WA. Prod. I. 262; Wight Jc. t. 328.)

Arbor mediocris, glabra; folia impari-pinnata, $\frac{1}{2}$ - $\frac{1}{2}$ ped. longa, glabra; foliola ovata ad elliptica et elliptico-ovata, petiolulis 1-2 lin. longis gracilibus, 3 (sec. WA. etiam 4-)juga cum impari, breve acuminata, apiculata v. obtusiuscula, $\frac{1}{2}$ -1 poll. longa, chartacea, integra, subtus subglaucescentia, subtiliter reticulata; flores solitarii v. subfasciculati cyanei, parviusculi, pedicellis capillaribus 2-3 lin. longis; racemi graciles, glabri, 2-3 poll. longi, solitarii v. plures e ramulis novellis orti; calyx glaber, purpurascens, latior quam longus, c. 1 lin. longus, obsolete dentatus v. subtruncatus; corolla glabra, vexillum c. $\frac{1}{2}$ poll. longum; ovarium parce adpresse pubescens; legumen lineari-oblongum, basin versus attenuatum, incurvato-acutum, planiusculum suturis obtusis, sublignosum, glabrum, pallidum, sparse verrucoso-lenticillatum, 2-3 poll. longum, ad medium 2-3-spermum.—*Prome.*

138. *MILLETTIA BRANDISIANA*, nov. sp.

Arbor mediocris, gemmis cupreo v. fulvo-pubescentibus, cæterum glabra; folia impari-pinnata, $\frac{1}{2}$ -1 ped. longa, glabra; stipellæ subulatæ, diutius persistentes; foliola 7-10-juga cum impari, oblongo-lanceolata, petiolulis lin. longis puberulis, obtuse acuminata, $1\frac{1}{2}$ -2 $\frac{1}{2}$ poll. longa, integra, juniora membranacea et subtus parce minuteque puberula, demum rigide sed tenuiter coriacea, glaberrima, subtus glaucescentia; flores cyanei, majusculi, pedicellis crassiusculis 2-3 lin. longis glabris suffulti, fasciculati, racemos 4-8 poll. longos glabros secus ramulos novellos distributos formantes; calyx purpureus, glaber, c. 2 lin. longus, tomentoso-fimbriatus, dentibus conspicuis, anteriore magis producto, posterioribus brevibus lateque connatis; corolla sericeo-pubescentia; vexillum $\frac{1}{2}$ poll. fere longum; ovarium adpresse pubescens; legumen obovato-oblongum ad oblongum et oblongo-lanceolatum, basi plus minusve attenuatum, rigide coriaceum, valde planum, subabrupte incurvato-acuminatum, 2-3 poll. longum, suturis haud incrassatis, brunnescens, læve, 1-3-spermum.—*Pegu. M. pulchræ* (= *Mundulea pulchra*, Bth.) affinis.

139. *MILLETTIA TETRAPTERA*, nov. sp.

Arbor mediocris, novellis molliter pubescentibus; folia impari-pinnata, $\frac{1}{2}$ - $\frac{3}{4}$ ped. longa, juniora molliter tomentella; foliola 3-(raro 2-1) juga cum impari, obovata ad elliptico-obovata, petiolulis crassis 1-2 lin. longis tomentosis, apice rotundata, subemarginata v. rarius apiculata, integra, novella membranacea et utrinque canescenti-tomentella, demum rigide chartacea et supra glabrescentia; flores fasciculati parviusculi, pallide lilacini, pedicellis 2-3 lin. longis dense pubescentibus; racemi 3-4 poll. longi, fulvo-v. gilvescenti-tomentosi secus ramulos foliatis novellos siti v. apicibus oppositifolii; calyx latior quam longus, $1\frac{1}{2}$ lin. longus, tomentosus, obsolete sinuato-dentatus v. subtruncatus; corolla glabra; vexillum c. $\frac{1}{2}$ poll. longum; ovarium adpresse pubescens; legumen subcuneato-oblongum, basi sterili attenuatum, lignosum, incurvato-acutum, 3-4 poll. longum, pallidum, læve, marginibus in alas irregulares lignosas sæpius undulatas angustas dilatatum et quasi tetrapterum, 1-2 spermum.—*Ana, Prome.*

140. *ERYTHRINA HOLOSERICEA*, nov. sp.

Arbor aculeato-armata, novellis furfuraceo-puberulis; folia iis *E. lithospermæ* conformia, 3-foliolata, petiolo 3-4 poll. longo, glabra; foliola plus minusve ovata, petiolulis 2-3 lin. longis, acuminata, 3-5 poll. longa, integra, chartacea v. membranacea, glabra; flores magni, coccinei? alis carinaque purpureis, subsessiles, 2-3-ni fasciculati, in racemo fulvo farinaceo-tomentoso collecti; calyx resupinatus, brevi-spathaceus brunneo-villosus, intus fulvescenti-sericeus; vexillum $1\frac{1}{2}$ poll. fere longum, obovato-cuneatum, obtusum, minute-velutinum; alæ falcato-oblongæ, obtusæ, c. $\frac{1}{2}$ poll. longæ; carina

c. $\frac{3}{4}$ pollicaris, e petalis 2 oblique oblongis acutiusculis breve unguiculatis medio tantum connatis composita; stamina monadelphæ; ovarium fulvotomentellum; legumen deest.—*Pegu*. Ex affinitate *E. lithospermæ*, Miq., (= *E. Sumatrana*, Miq.) vix Bl. cujus planta e Mauritio in Hort. Bog. allata fuerat. (cf. Bl. Cat. Buitenz.)

141. *DALBERGIA CANA*, Grah. in Wall. Cat. 5859.

Arbor magna, novellis pubescentibus glabrescentibus; folia imparipinnata; juniora parce pubescentia, mox glabrescentia, 1-2 ped. longa; foliola 7-9-juga, alterna, petiolulis 1-1 $\frac{1}{2}$ lin. longis glabrescentibus, oblonga ad ovato-v. lineari-oblonga, sæpius subinæqualia, breve et subabrupte acuminata, 2-2 $\frac{1}{2}$ poll. longa, integra, chartacea, adulta glabra v. subtus subpuberula; flores parvi, luride purpurei, pedicellis capillaribus puberulis 1-2 lin. longis suffulti, paniculam laxam puberulam breve pedunculatam axillarem v. sublateralem formantes; calyx atropurpureus, glaber v. subglaber, c. 2 lin. longus, dentibus obtusis; corolla glabra, 3 lin. fere longa, petalis longe unguiculatis; stamina 10, diadelphæ; ovarium pilosum; legumen lineari-oblongum, planum, 3-1-spermum, obtusum, basi in stipitem brevem constrictum 3-4 poll. longum, fulvo-velutinum, circa semina indistincte venosum.—*Pegu Martaban, Tenasserim*.

142. *DALBERGIA GLOMERIFLORA*, nov. sp.

Arbor mediocris, decidua, novellis fulvescenti-tomentosis; folia juvenilia tomentosa glabrescentia, imparipinnata; folia 3-4-juga, alterna, ovata ad elliptica et obovata, petiolulis parce pubescentibus 1-2 lin. longis, acuta, 2-2 $\frac{1}{2}$ poll. longa, integra, tenuiter coriacea, supra glabra, subtus parce puberula; flores parvi, albi, pedicellis brevissimis, v. subsessiles, in paniculas subcapitatas ramulos novellos villosos terminantes conglomerati; calyx c. 1 $\frac{1}{2}$ lin. longus, glaber, dentibus obtusis; corolla glabra, calyx paullulo longior, petalis brevissime unguiculatis; stamina 10, diadelphæ; ovarium glabrum; legumen desideratur.—*Prome*.

ARTILLARIA, gen. nov.

Calyx amplus, dentibus 2 superioribus paullo majoribus. Vexillum suborbiculare, alæ carinaque subconformes, securiformi-falcatae; petala omnia breve unguiculata et libera. Stamina 10, libera, inæqualia, omnia fertilia; antheræ versatiles. Ovarium brevi et crasse stipitatum, 2-ovulatum; stylus filiformis, revolutus, stigmatibus laterali. Legumen oblongum, teres, carnosum-coriaceum, utrinque dehiscens. Semina 2 v. abortu ut plurimum solitaria, magna, oblonga, nigra, arillo carnosissimo miniato complete involutum. Cotyledones crassæ, radícula centrifugalis.—Arbor foliis imparipinnatis, foliolis oppositis stipellatis. Flores majusculi, albi, racemosi, in paniculas terminales collecti. Genus juxta *Ormosiam* ponendum, arillo insigni, unde nomen.

Chenobii species ambæ a cl. Miquelio confectæ ad *Ormosiam coarctatam*, Jack, reducendæ.

143. A. ROBUSTA, (*Sophora robusta*, Roxb., Hort. Beng. 31; Wight Jc. t. 245; *Ormosia floribunda*, Wall. Cat. 5337.)

Arbor mediocris sempervirens, novellis fulvo-velutino-tomentosis; folia impari-pinnata, $1-1\frac{1}{4}$ ped. longa, rachi fulvescenti-pubescente; stipellæ persistentes, c. 2 lin. longæ, lineari-subulatæ, pubescentes; foliola 4-5-juga, oblonga, petiolulis crassis 2 lin. longis pubescentibus, acuta v. apiculata, 3-4 poll. longa, integra, tenuiter coriacea, adulta supra glabra, subtus fulvescenti-puberula; flores majusculi, luride albi, pedicellis brevibus crassis tomentosis suffulti, racemosi, in paniculam terminalem robustam ferrugineo-v. fulvo-tomentosam collecti; bracteæ persistentes, lineares, tomentosæ, 2-3 lin. longæ; calyx amplus, 3 lin. fere longus, dense tomentosus; corolla glabra, c. 3 lin. longa; ovarium villosum; legumen oblongum v. elliptico-oblongum, basi in stipitem brevem pubescentem crassum contractum, acutum, carnosocoriaceum, luteum v. gilvum, parce pubescens v. subglabrum, monospermum 2- spernum; semen magnum, oblongum, atterrimum, lucidum, arillo miniato dein sanguineo carnosio complete involutum.—*Pegu, Tenasserim.*

144. PTEROLOBIUM MACROPTERUM, nov. sp. (*P. lacerans*, Miq. Fl. Ind. Bat. I. 106, non R. Br.)

Frutex magnus scandens, aculeis brevibus armatus, novellis parce pubescentibus; folia $\frac{1}{2}-\frac{3}{4}$ ped. longa, abrupte bipinnata, pinnis 7-8 v. pluribus rachibus aculeatis puberulis; foliola 7-9 v. pluri-juga, subsessilia, inæquali-oblonga v. elliptico-oblonga, $\frac{1}{3}-\frac{1}{2}$ poll. longa, apice rotundata v. retusa, membranacea, glabra, subtus pallida; flores albi, parvi, breviter pedicellati, racemos axillares solitarios (glabros?) efficientes; legumina samaroidea, basi seminifera plus quam $\frac{1}{2}$ poll. longa, elliptico-oblonga, ala sesquipollicari, pollicem fere lata, semi-oblonga, apice rotundata, sutura interiori recta, nec arcuata.—*Pegu, Martaban, Tenasserim.*

Species Indicæ 3 mihi notæ, nempe, *P. microphyllum*, Miq. (Hb. Maingay No. 535) racemis in paniculas terminales amplas dispositis, et *P. lacerans*, R. Br. (Wight Icon. t. 196), cum specie nova supra descripta racemis axillaribus solitariis conjunctum, leguminibus autem valde discrepans.

145. CASSIA RENIGERA, Wall. Cat. 5307; Bth. in Linn. Trans. XXVII. 518.

Arbor mediocris, novellis molliter pubescentibus; folia abrupte pinnata, $\frac{1}{2}-1$ ped. longa, molliter pubescentia; stipulæ magnæ, lunato-reniformes, deciduæ; foliola 8-20-juga, petiolulis brevissimis, v. subsessilia, elliptico-oblonga ad oblonga, obtusa v. retusa cum mucrone minuto, $\frac{1}{2}-1\frac{1}{2}$ poll. longa,

membranacea, molli-pubescentia; flores speciosi, purpurei, pedicellis 1-1½ pollicaribus pubescentibus, in racemos solitarios v. geminatos supra foliorum delapsorum cicatricibus ortos pubescentes brevissimos dense bracteatos collecti; bracteae cordato-ovatae, longe acuminatae, pubescentes; calyx breve denseque pubescens; petala oblonga, pollicem fere longa, obtusiuscula; ovarium filamentaque glabra; filamenta longiores medio incrassata; legumen cylindricum, 1-2 ped. longum, indehiscens, glabrum.—*Ava, Prome.*

146. *BAUHINIA ROSEA*, nov. sp.

Frutex scandens, novellis fulvo-puberulis; folia cordato-rotundata, usque ad ½ partem biloba, lobis rotundatis cum aristâ brevi in eorum sinu auctis, petiolo 1½-2 pollicari puberulo, 3-5 poll. longa et lata, integra, chartacea, juniora supra fugaci-pubera mox glabra, subtus fulvescenti puberula; flores parviusculi, rosei, pedicellis 1½-2 poll. longis gracilibus adpresse puberulis, racemum terminalem bracteatum corymbiformem fulvo-pubescentem formantes; bracteae lineari-lanceolatae, acuminatae, c. 4 lin. longae; calyx adpresse fulvo-puberulus, tubo brevi, lobis in alabastro tereti-ovoideis, dein liberis et reflexis 4 lin. longis lineari-lanceolatis; petala longe unguiculata, obovato-linearia, undulata, utrinque parce adpresse pubescentia, c. ¾ poll. longa; ovarium cum stylo crasso brevi (ovario breviori) fulvo-villosum; legumen deest.—*Martaban.* (Dr. Brandis.) *A. B. Vahlîi* inter alia differt stylo et floribus minoribus.

147. *BAUHINIA ORNATA*, nov. sp.

Frutex alte scandens cirrhiferus, novellis ferrugineo-pubescentibus; folia cordato-ovata ad cordato-rotundata, petiolo 1½-3 poll. longo in juventute ferrugineo-pubescente suffulta, usque ad ½ v. ⅔ partem biloba, lobis obtusiusculis v. obtusiuscule acuminatis et in sinu aristatis, 4-7 poll. longa et lata, integra, chartacea, juniora subtus parce adpresse ferrugineo-pubescentia, mox glabrescentia, palmatim 11-15-nervia; flores parvi, albi, pedicellis gracilibus 1-1½ pollicaribus, ferrugineo-pubescentibus, apice pedunculi longioris v. brevioris glabrescentis in racemum corymbiformem multiflorum bracteatum fulvo-pubescentem lateralem v. terminalem congregati; bracteae lineari-lanceolatae, pubescentes, c. 2 lin. longae; calyx in alabastro pyriformis, adpresse pubescens, lobis ovatis c. 3 lin. longis reflexis; petala obovato-oblonga, extus parce pubescentia, subundulata, c. 4 lin. longa; ovarium fulvo-villosum, stylo longo gracilique glabro; legumen non repertum.—*Pegu.*

148. *BAUHINIA INVOLUCELLATA*, nov. sp.

Frutex scandens, novellis parce puberulis; folia cordato-ovata, petiolo glabro 1½-2 poll. longo, usque ad ½-¾ partem biloba, lobis obtusiuscule acuminatis in sinu aristatis, 3-4 poll. longa, integra, tenuiter chartacea, glabra, palmatim 9-11-nervia; flores majusculi, pallide rosei, pedicellis 2-2½ polli-

caribus puberulis glabrescentibus infra apice bibracteolatis suffulti, racemum longiorem v. breviorum laxum terminalem puberulum glabrescentem formantes; bracteae minutae, indistinctae; bracteolae sub calyce elliptico-oblongae, obtusiusculae, $\frac{1}{2}$ poll. longae, intus velutinae, quasi involucrum bifoliatum formantes; calyx velutinus, tubo sulcato-tubulari, c. 3 lin. longus v. longior, lobis in alabastro oblongo-ovato lanceolatis acuminatis $\frac{1}{2}$ poll. longis dein liberis et reflexis; petala $1\frac{1}{2}$ poll. fere longa, lamina ovato-oblonga, obtusa, unguis longitudine; ovarium laeve, stylo longiusculo sed crasso; stamina fertilia 3; legumen desideratur.—*Martaban* (Dr. Brandis).

149. *BAUHINIA MONANDRA*, nov. sp.

Frutex? novellis puberulis; folia parva, rotundato-ovalia, basi truncata, petiolo $\frac{1}{2}$ -1 pollicari brevis pubescente, usque ad $\frac{1}{2}$ partem biloba, lobis rotundatis in sinu aristatis, $1-1\frac{1}{2}$ poll. longa, integra, chartacea, supra glabra, subtus praesertim secus nervos brevis pubescentia, palmatim 11-nervia; flores majusculi, albi? petalo inferiore maculato, pedicellis $1-1\frac{1}{2}$ pollic. longis dense puberulis, racemos breves terminales pubescentes formantes; bracteae parvae, subulatae; calyx extus tomentellus, in alabastro fusiformis, spathaceus; petala obovato-cuneata, c. $1\frac{1}{2}$ poll. longa, glabra, undulata, stamen perfectum unicum tantum, caetera omnia rudimentaria; ovarium stipitatum fulvo-villosum, suturis laevibus, stylo gracili ovarii ipsius duplo longiore terminatum; legumen deest.—*Burma, Martaban?* (Dr. Brandis). Ex affinitate *B. tomentosae*, cum *B. brachycarpa*, Wall., ultro comparanda.

150. *AFZELIA RETUSA*, nov. sp.

Arbuscula glaberrima; folia abrupte pinnata, rachi brevissima glabra; foliola uni- v. bijuga, plus minusve ovalia, sub-obliqua, brevissime petiolulata, $1\frac{1}{2}$ -2 poll. longa, integra, chartacea, emarginata, glabra; flores parviusculi, albidi pedicellis c. 4 lin. longis glabris, racemos breves simplices glabros in ramulis terminales efficientes; bracteolae sub calyce 2 parvae, concavo-cymbiformes, persistentes; calyx laevis, tubo c. 4-lin. longo, lobis obovato-oblongis aequi-longis; legumen 3-4 poll. longum, $1-1\frac{1}{2}$ poll. latum tenuiter coriaceum, oblongum, secus margines incrassatos subcurvum, glabrum.—*Andamans.*

151. *PARKIA LEIOPHYLLA*, nov. sp.

Arbor vasta, 80-120 pedalis, novellis pubescentibus; folia abrupte bipinnata, 1-2 pedalia, pinnis c. 20 v. pluribus suboppositis, rachibus brevis pubescentibus; foliola c. 30-40, sessilia, opposita, lineari-oblonga, subfalcata, basi oblique auriculata, $\frac{1}{2}$ poll. longa, c. 2 lin. lata, oblique acuta, tenuiter coriacea, glaberrima, unicostata cum nervo solitario basilari laterali, penninervia; flores parvi, flavescentes, in receptaculo irregulari-globoso basi

in stipitem pollicem fere longo contracto sessiles et capitulum densiflorum clavatum longe-pedunculatum formantes; pedunculi $1-1\frac{1}{2}$ pedales, glabri, racemosi, terminales; calyx 4 lin. fere longus, tubo glabro, lobis rotundatis extus dense fulvo-tomentosis; legumen $1-1\frac{1}{2}$ ped. longum, lineare, in stipitem $\frac{1}{2}-\frac{3}{4}$ pedalem attenuatum, apice rotundatum, glabrum et subvernicosum, nigrum, inter semina numerosa torosum.—*Pegu.*

152. *PARKIA INSIGNIS*, nov. sp.

Arbor vasta, 80-100-pedalis, novellis fulvo-pubescentibus; folia abrupte bipinnata, 1-2-pedales, pinnis c. 8 suboppositis, rachibus fulvo-v. ferrugineo-tomentosis; foliola 20-25 juga, subopposita, subfalcata, oblonga, cum basi inæquali sub-auriculata sessilia, apice rotundata, 1 poll. longa, $\frac{1}{3}$ poll. lata, integra, coriacea supra nervis exceptis glabra, subtus pubescentia, penninervia, nervis arcuatim anastomozantibus; flores parvi, lutei in receptaculo clavato-orbiculari basi in stipitem pollicarem attenuato sessiles et capitulum clavato-pyriformem longe pedunculatum efformantes; pedunculi pedales, plures ex apice ramorum orientes; calyx c. 4 lin. longus, tubo glabro v. subglabro, lobis obovato-cuneatis adpresse fulvo-pubescentibus; legumina non vidi.—*Martaban.*

153. *ALBIZZIA (Pithecolobium) GLOMERIFLORA*, nov. sp.

Frutex 2-5-pedalis, novellis puberulis, ramulis subangularibus v. teretibus; folia abrupte bipinnata, pinnis unijugis, petiolus $1-1\frac{1}{2}$ pollicaris, rachibus vix angularibus præsertim junioribus puberulis; foliola 3-raro 2-juga, petiolis brevissimis puberulis, oblique oblongo-lanceolata ad subrhomboideo-lanceolata breve mucronato-acuminata, 1-2 poll. longa, tenuiter et rigide coriacea, adulta glabra v. subglabra, v. secus costam puberula, subtus glaucescentia et secus nervos pubescentia; flores parvi, virescenti-albi, sessiles, in capitula pisi magnitudinis pedunculis gracillimis $\frac{1}{2}-1$ pollicaribus puberulis instructa congregati et in racemos graciles puberulos axillares dein sæpius paniculam terminalem foliatam simulantes dispositi; calyx vix $\frac{1}{2}$ lin. longus, pubescens; corolla usque ad calycis limbum lobata, extus pubescens, c. $1\frac{1}{2}$ lin. longa; legumina non adsunt.—*Martaban.*

RUBIACEÆ.

154. *PAEDERIA CALYCINA*, nov. sp.

Herba volubilis, novellis puberulis; folia cordato-ovata ad cordato-lanceolata, petiolo $1-1\frac{1}{2}$ pollicari puberulo suffulta, basi sinuato-cordata, acuminata, 2-3 pollicaria, integra, membranacea, utrinque præsertim subtus parce hispidula; flores ... superiores pedicellati, lateralibus sessilibus v. subsessilibus, in cymas dichotomas secundas parvas parce hirsutas digesti, et paniculas thyrsoides brachiatas hirsutulas axillares et terminales efformantes;

calyx indistincte puberulus, tubo c. $\frac{1}{2}$ lin. longo v. longiore, lobis fere duplo longioribus, lanceolatis, subfoliaceis; corolla ...; capsulæ ovoideæ, c. 4 lin. longæ, compressæ, brunneæ et lucidæ, calycis limbo conspicuo coronatæ; semina capsulis conformia, alâ nigrescenti c. $\frac{1}{2}$ lin. latâ circumdata.—*Tenasserim* (Wall. Cat. 6247 E).

Rubiacearum genera 44 in regno Burmanico occurrentia mihi cognita sunt, quorum conspectum hic addo:—

Trib. I. *STELLATÆ*. Calyx ovario omnino adnatus, v. limbo 4-6-fido. Corollæ lobi valvati, ovarium 2-loculare, ovulis in loculis solitariis erectis, adscendentibus v. raro pendulis. Drupa indehiscens, sicca v. succulenta. Semina exalata et libera, v. raro membrana alatum-expansa circumdata.—Stipulæ utplurimum in folia stipulacea transformata et foliis conformes v. subconformes, hinc cum foliis verticillata, raro folia normaliter opposita.

§ 1. *Eustellatæ*. Semina magis minusve globosa, libera, erecta v. adscendentia. Stipulæ foliaceæ evolutæ.

1. *Rubia*, *L.* Flores pentameri. Drupa succulenta. Herbæ annuæ v. perennes, erectæ v. scandentes.
2. *Galium*, *L.* Flores 4-meri. Drupa utplurimum didyma, v. globosa, exsucca. Herbæ perennes v. annuæ, erectæ v. prostratæ.

Trib. II. *COFFEACEÆ*. Drupa magis minusve carnosa v. succulenta, rarius bacca, 1-pluri-locularis, ovulis 1 v. pluribus in singulo loculo. Semina haud alata v. appendiculata. Stipulæ interpetiolares veræ connatæ v. liberæ.

Subtrib. 1. *Coffeæ*. Ovarium 2-loculare, ovulis in loculis solitariis erectis v. medio affixis. Bacca e pyrenis 2 v. pluribus (raro abortu solitariis) tenuicrustaceis v. membranaceis monospermis composita.

§ Ovarium 2-loculare.

* Corolla valvata. Albumen vulgo carnosum (*Psychotriæ*).

3. *Cephaelis* *L.* (incl. *Geophila*, Don). Corolla infundibuliformis tubo longo. Calyx 4- v. 5-dentatus v. lobatus. Flores capitati v. solitarii, axillares. Suffrutices v. herbæ perennes repentes.
4. *Hydnophytum*, *Jack.* Calycis limbus integer. Corollæ tubus brevis. Flores glomerati sessiles. Frutices epiphyti truncis tuberosis.
5. *Psychotria*, *L.* Corollæ tubus brevis, fauce barbata. Pyrenæ facie interna planæ et integræ. Flores cymosi v. cymosopaniculati. Frutices, raro suffrutices, raro scandentes.
6. *Chasalia*, *Comm.* Corollæ tubus elongatus, fauce nudus. Pyrenæ facie interna secus placentam centram excavatæ. Frutices v. suffrutices; inflorescentia precedentis.

** Corollæ lobi imbricati v. contorti. Albumen vulgo osseum. (*Ixoreæ*.)

7. *Ixora*, L. Corolla hypocraterimorpha, limbo 4-5-partito. Ovula medio affixa. Flores corymbosi v. paniculati. Stipulæ connatæ.
8. *Coffea*, L. Corolla infundibuliformis, glabra, limbo 4-7-partito. Baccæ 2- raro 1-spermæ, semina pyrenis chartaceis inclusa. Flores terminales et axillares. Stipulæ liberæ. (Hic *Prismatomeris*, Thw.).
9. *Serissa*, Comm. (incl. *Saprosma*, Bl., *Dysodidendron*, Gardn.). Corolla infundibuliformis, velutina, sæpius unacum calyce subobliqua. Ovula erecta, basilaria. Baccæ 1- rarius 2-spermæ. Flores terminales et axillares. Stipulæ liberæ.
§ Ovarium 4-9-loculare. (*Lasianthææ*).
10. *Lasianthus*, Jack. Calyx magis minusve dentatus. Styli et ovarii loculi 4-9. Frutices erecti; flores glomerati v. cymosi, axillares.
11. *Gynochthodes*, Bl. Calycis limbus truncatus. Styli 2-fidi. Ovarium 4-loculare. Frutices scandentes; flores glomerati, axillares.

Subtrib. 2. VANGUERIÆ. Ovarium 1- ∞ -loculare, loculi 1-v. raro (in *Polyphragmone*) ∞ -ovulati, ovulis lateraliter affixis v. a medio v. ex apice loculorum pendula. Pyrenæ duræ et osseæ, v. in putamen durum connatæ, v. liberæ et laxiuscule compactæ. Albumen vulgo carnosum.

§ 1. *Euvangueriæ*. Corolla valvata. Ovula lateraliter v. sub apice affixa.

12. *Vangueria*, Comm. Stigma discoideum. Ovarium ut plurimum 5-loculare.

13. *Canthium*, Lamk. Ovarium 2-loculare. Drupæ didymæ, v. abortu passim sub-1-loculares. (Hic *Polyozus*, Miq., non Lour.)

§ 2. *Guettardeæ*. Corolla imbricata.

* Ovarium 2-loculare, ovulis in loculis singulis 2-placentæ centrali affixa. Drupæ elongatione placentæ spurie 4-loculares, loculis spuriis 1-spermis. Pyrenæ in putamen connatæ.

14. *Scyphiphora*, Gærtn. Styli 2. Drupæ angulato-sulcata. Ovulum in loculo superiori spurio erectum, alterum in inferiori pendulum.

** Ovarium 4- ∞ -loculare, ovulis in loculis solitariis pendulis. Pyrenæ in putamen ∞ -loculare connatæ, loculis monospermis.

15. *Guettarda*, L. Stigma crassum, simplex. Drupæ globosæ, majusculæ.
 * * * Ovarium pluri-loculare, ovulis in loculis pluribus v. numerosis, secus placentas centrales superposita. Drupæ baccatæ, 5-10-loculares, loculi pyrenas spurias (seminibus testa crustaceo-induratâ ?) plurimas continentes.

16. *Polyphragmon*, Desf. Stigmata tot quot ovarii loculi.

Subtrib. 3. *RANDIÆ*. Ovarium v. 1-loculare placentis parietalibus, v. sæpius 2- ∞ -loculare, loculis ∞ -ovulatis. Semina libera, nec pyrenis inclusa.

§ 1. *Gardeniæ*. Ovarium 1-loculare, placentis 4-5 parietalibus. Corolla imbricata.

17. *Gardenia*, L. Flores sæpius conspicui. Stigma integrum, sulcato-tortuosum. Bacca magna, ∞ -sperma, seminibus in pulpa nidulantibus.

§ 2. *Eurandiæ*. Ovarium 2-loculare. Corolla imbricata.
 * Placenta simplex.

18. *Randia*, L. Stigma bilobum; stylus fusiformi-incrassatus. Baccæ magnæ; semina in pulpo nidulantia. Arbores v. frutices erecti.

19. *Griffithia*, W.A. Stigma bilobum; stylus æqualis, haud incrassatus. Baccæ parvæ, haud pulposæ. Frutices scandentes sæpius armati.

20. *Webera*, Schreb. Stigma simplex; stylus æqualis, filiformis. Baccæ parvæ, epulposæ. Arbores v. frutices erecti, inermes.

21. *Diplospora*, DC. Stylus 2-fidus. Baccæ majusculæ, epulposæ. Semina in loculis biseriata (an semper?). Arbores v. frutices erecti inermes. (An potius cum sequenti conjungendum?)

22. *Hypobathrum*, Bl. Stylus 2-lobus. Baccæ parvæ, v. pedicellatæ, epulposæ. Semina in loculis uniseriata. Frutices erecti. (Hic Hyptianthera, W.A., Petunga, DC. et probabiliter Scyphostachys, Thw., et Pristidia, Thw.).

* * Placentæ 2-fidæ. Stigma 2-5-lobum.

23. *Mussaenda*, L. Unus alterve calycis loborum florum exteriorum foliaceo-appendiculatus. Antherarum connectivum haud mucronatum.

24. *Acranthera*, Arn. Calycis dentes haud appendiculati, conformes. Antherarum connectivum mucronato-productum.

§ 3. *Urophyllæ*. Ovarium vulgo 5-6- raro 2-3-loculare. Corolla valvata.

25. *Adenosacme*, Wall. Calyx 5-4-fidus. Corollæ faux nuda. Cymæ v. corymbi terminales v. subterminales, raro laterales.

26. *Urophyllum*, Jack. Calyx integer v. minute denticulatus. Corollæ faux barbata. Florum glomeruli v. cymæ axillares.

Trib. III. CINCHONACEÆ. Capsula exsucca, vario modo dehiscens v. rarisime indehiscens [vel si carnescens uti in *Sarcocephalo*, v. baccata (uti in *Morindeis*) semina semper alata v. appendiculata]. Ovarium 2- ∞ -loculare, loculis 1- ∞ -ovulatis. Semina alata, appendiculata, v. nuda. Stipulæ interpetiolares veræ.

Subtrib. 1. Ovarii loculi 2-4, ∞ -v. (in *Cephalantho* ? 1-) ovulati. Capsulæ vario modo dehiscentes. Semina plus minusve alata v. appendiculata.

§ 1. *Morindeæ*. Flores dense capitati. Ovarium 2-v. ∞ -loculare, ovula solitaria et erecta v. numerosa et pendula. Baccæ v. drupæ baccatæ ut plurimum in receptaculo incrassato congregatæ et sæpius in syncarpium connatæ.

* Ovula et semina in loculis numerosa, imbricato-pendula.

27. *Psilobium*, Jack. Baccæ elongatæ, subfolliculares, discretæ. Arbores v. frutices.

* * * Ovula et semina in loculis solitaria, erecta.

28. *Morinda*, L. Baccæ sæpius in syncarpium connatæ. Arbores v. frutices, nonnunquam scandentes.

§ 2. *Naucleæ*. Flores in receptaculo incrassato capitati. Capsulæ a basi v. alius modi dehiscentes, siccæ, v. raro (in *Cephalantho*) baccatæ.

* Capsulæ baccatæ, a basi dehiscentes.

29. *Sarcocephalus*, Afz. Capsulæ baccatæ 2-loculares, v. loculis 2 superpositis sterilibus auctæ, in syncarpium connatæ.

* * Capsulæ siccæ, loculicide v. septicide in cocos 2- ∞ -v. raro monospermos dehiscentes.

O. Capsulæ in cocos 2- ∞ -spermos dehiscentes. Corollæ et calycis lobi dentibus interjectis carentes.

30. *Nauclea*, L. Flores bracteolis carentes. Arbores, raro frutices erecti.

31. *Stephegyne*, Korth. Flores bracteolis angulari-clavatis circumdati. Arbores.

OO. Capsulæ 2-4-loculares, loculis 1-ovulatis. Calycis et corollæ lobi in sinibus denticulati.

32. *Cephalanthus*, L. Flores 4-meri, bracteolis lineari-clavatis circumdati. Frutices v. arbusculæ.
 ○○○. Capsulæ 2-loculares, rimis longitudinalibus dehiscentes. Scandentes.
33. *Uncaria*, Schreb. Flores sessiles v. pedicellati, bracteolis destituti.
 § 3. Eucinhoneæ. Flores paniculati v. corymbosi, haud capitati. Capsulæ 2-loculares, septicide in valvas 2 v. apice 4-valvatim dehiscentes.
 * Capsulæ in valvas 2 lignosas septicide dehiscentes.
34. *Hymenodyction*, Wall. Arbores; inflorescentiæ foliis floralibus discoloribus gaudentes.
 * * Capsulæ apice 4-valvatim dehiscentes.
35. *Hymenopogon*, Wall. Frutices epiphytici; inflorescentia foliis floralibus discoloribus gaudens.
- Subtrib. 2. SPERMATOCOEÆ. Ovarii loculi 2-4, loculis 1-v. pluri-ovulatis. Capsulæ vario modo dehiscentes v. in coccis 2-4 separantes, raro indehiscentes. Semina nunquam alata v. appendiculata, numerosa v. solitaria.
- § 1. Hedyotideæ. Ovula et semina in loculis plura v. numerosa, lateraliter affixa.
 ○ Stipulæ connatæ v. liberæ, haud vaginantes v. setaceo-fimbriatæ. (Rondeletieæ).
 * Stigma 2-fidum v. -lobum. Corolla imbricata v. tortuosa. Antherarum loculi mutici.
36. *Wendlandia*, Bartl. Corolla tubulosa, tortuosa. Capsulæ apice bivalvatim dehiscentes. Arbores v. frutices. (Hic *Greenia*, WA.)
37. *Spiradiclis*, Bl. Corollæ tubus brevis. Capsulæ in valvas 2 iterato bivalvatim separatas marginibus inflexas dehiscentes. Herbæ annuæ, erectæ.
38. *Ophiorrhiza*, L. Corolla infundibuliformis v. tubulosa. Placenta erecta, libera. Capsulæ compressæ, divaricato-2-lobæ, apice rima loculide-dehiscentes. Herbæ annuæ v. perennes.
 * * Stigma capitatum. Corolla valvata. Antherarum loculi in appendicem sterilem setaceum prolongati.
39. *Argostema*, Wall. Corolla subrotata, limbo 3-7-fido. Capsulæ apice valvis 4 dehiscentes. Herbæ Melastomacearum habitu.
 ○○ Stipulæ petiolis adnatæ et basi vaginantes, setaceo-ciliatæ. (*Euhedyotideæ*.)
40. *Dentella*, Forst. Flores 5-meri, petala 2- v. 3-dentata. Capsulæ vix dehiscentes.

41. *Hedyotis*, L. Flores 4-meri; petala integra. Capsulæ loculicide v. septicide dehiscentes, v. in coccos 2 v. 4 pleiospermos separantes.
- Subg. 1. *Oldenlandia*. Capsulæ magis minusve hemisphericæ et obsolete 2-lobæ, loculicide dehiscentes.
- Subg. 2. *Dimetia*. Capsulæ apice rima hiantè brevi septicide dehiscentes, magis minusve truncato-hemisphericæ et obsolete 2-lobæ.
- Subg. 3. *Metabolos*. Capsulæ septicide dehiscentes v. subdehiscentes, hemisphericæ, apice magis minusve truncatæ, sæpius obsolete 2-lobæ.
- Subg. 4. *Scleromitron* (Allæomorpha, Thw.). Capsulæ in coccos 2, v. eorum divisione, 4 indehiscentes pleiospermos separantes, calycis lobis convergentibus coronatæ. Calyx magis minusve ovoideus v. obovatus. An revera genus proprium? Spermacocis characteribus gaudens sed ovulis et seminibus plurimis discrepans et inter Hedyotidem et Spermacocem quasi intermedium.
- § 2. *Euspermacocæ*. Ovula et semina in loculis erecta et solitaria. Capsulæ dehiscentes, v. in coccos separantes, v. raro indehiscentes.
42. *Spermacoce*, L. (incl. *Hydrophylax*, L. f. ?) Ovula medio s. sub medio loculorum affixa. Capsulæ ab apice septicide dehiscentes. Herbæ annuæ v. perennes.
43. *Knoxia*, L. Ovula apice v. sub apice loculorum affixa. Capsulæ a basi in coccos 2 caducos separantes, axim persistentem setaceum relinquentes. Herbæ annuæ v. perennes.
- § 3. *Pæderiæ*. Ovula et semina compressa in loculis pendula et solitaria. Capsulæ drupæformes, crustacæ, v. pergamacæ, vix dehiscentes, coccos 2 tenui-membranaceos alatim expansos includentes. An potius inter Coffeaceas recipiendæ?
44. *Pæderia*, L. Corolla valvata. Folia opposita v. 3-4-na verticillata. Volubiles.

COMBRETACEÆ.

155. *TERMINALIA TOMENTELLA*, nov. sp.

Arbor magna, novellis adpresse cupreo-pubescentibus; folia 5-8 poll. longa, petiolo 8-12 lin. longo apice biglanduloso suffulta, basi inæquali decurrentia, ovata ad ovato-oblonga, acuta v. subacuta, coriacea, integra, junio-

ra subtus dense, adulta parce cupreo-pubescentia v. omnino glabrescentia; flores parvi, sessiles, spicati, paniculam parvam ferrugineo- v. fulvo-tomentellam componentes; bracteolæ subulatae, floribus longiores, deciduæ; calycis lobi triangulares, acuti, extus glabri, intus unacum glandulis hypogynis albo-lanuginosi; tubus ovatus, teres, glaberrimus; drupæ poll. vix longæ, ovatae, obsolete 5-gonæ v. teretes, lutescentes, læves.—*Pegu, Martaban, Tenasserim. T. Chebulæ*, Retz., quam maxime affinis, calycis tubo lævissimo, indumento copiosiore et fructibus minoribus distat.

BEGONIACEÆ.

156. BEGONIA NIVEA, Parish MS.

Herbula succulenta radice tuberosa?, subglabra; folia radicalia 1 v. 2, obovato-oblonga, apice irregulariter truncato-angulata, basi in petiolum brevissimum crassum glabrum constricta, dentata et parce setuloso-ciliata, palmatim 5-nervia, 2-3 poll. longa, membranacea, supra setulis brevibus adspersa, subtus glabra; scapus radicalis, glaberrimus, folio duplo longior, apice bibracteato, flores 2 v. 3 majusculos candidos gerens; bracteæ 2 ovales v. ovali-oblongæ, acutæ, foliaceæ, c. 2-3 lin. longæ; flores feminei pedicellis brevioribus, masculi longioribus 1-1½ poll. longis glabris, instructi; sepala et petala obovato-oblonga ad lato-ovalia, c. 5 lin. longa, in femineis aliquanto breviora; stamina monadelpha; antheræ obovato-oblongæ, obtusæ; styli 2, basi v. ad medium fere connati, uno 3- altero 2-bifido et glandulis stigmaticis stipitatis dense obducti; capsulæ immaturæ glabræ, oblongo-ovatae, inæquali-3-alatæ, alis triangularibus et acute productis, medio majore.—*Tenasserim* (Revd. Parish).

157. BEGONIA SUBPERFOLIATA, Parish MS.

Herbula erecta, succulenta, radice tuberosa? scapigera; folia radicalia solitaria, petiolo 1½ usque ad 3½ poll. longo subvelutino suffulta, ovata ad ovato-oblonga, vix inæqualia, basi rotundata leviter peltata, obtusiuscule acuminata, grosse crenato-dentata, 2-3 poll. longa, membranacea, utrinque pulcherrime concavo-punctata (in vivo probabiliter papilloso-holosericea), subtus ut plurimum subpurpurascens; scapus radicalis v. subradicalis, glaber, folio brevior, dichotomo-cymosus, pauciflorus; bracteæ virides, elliptico-lanceolatae, acutæ, c. lin. longæ, papillosæ; flores parvi, rosei, pedicellis capillaribus glabris; sepala ovalia, obtusa, 2-3 lin. longa, extus conspicue venosa; stamina monadelpha; antheræ breves, obovatæ; styli 3, alte connati, 2-fidi; capsulæ c. 3 lin. longæ, obovatæ, glabræ, 3-loculares, 3-alatæ, alis capsulâ ipsâ latioribus semi-obcordatis; placentæ 2-fidæ.—*Tenasserim* (Revd. Parish).

158. BEGONIA VELUTINA, Parish MS.

Herbula simplex, scapifera, unifoliata, radice parva tuberosa; folium petiolo 1-3 poll. longo nonnunquam parce pubescente suffultum, cordato-ova-

tum ad cordato-rotundatum, palmatum 7-nerve, obtusum, v. breve et obtusiuscule acuminatum, irregulariter et breve lobatum, dentatum et ciliatum, c. 1-2 poll. longum et latum, membranaceum, supra papillosum et pilis minutis brevibus adpersum, subtus secus nervos adpresse pubescens; scapi radicales, folio vulgo sublongiores, glabri, pauciflori; bractæ minutæ, lineares; flores majusculi, rosei? sepala 4 lin. fere longa, lato-ovalia, obtusa; petala minuta, lineari-lanceolata, acuminata; perianthii feminei lobi dimidio breviores; stamina numerosa, libera; antheræ obovatæ, breves, truncatæ; stigmata 3, libera, apice dilatato in lobos stigmatiferos 2 tortuosos divergentia; capsulæ immaturæ obovatæ, glabræ, 3-loculares, anguste 3-alatæ alis apice truncatis; placentæ bifidæ.—*Tenasserim* (Revd. Parish, Dr. Stoliczka).

Begonia species Burmanicæ sequenti modo distingui possunt:—

Subg. I. CASPAREA. DC. Capsulæ carnosæ et bacciformes, secus angulos v. alas crassas latas dehiscentes.

Herba robusta glabriuscula ramosa; styli 4; capsulæ 4-loculares et 4-angulares, angulis in appendices cornutos productis, *B. Roxburghii*.

Subg. II. *Begonia*, DC. Capsulæ siccæ, lineâ semicirculari secus lateres alarum v. angulorum dehiscentes.

* Styli 2, bifidi v. vario modo dilatati v. ramosi; capsulæ 2-loculares; placentæ bifidæ.

† Stamina libera. Capsulæ inæquali-3-alatæ, alis 2 anterioribus sæpius ad costam membranaceam reductis.

Herba robusta, ramosa, molliter paleaceo-pilosa; folia longipetiolata, lobata, *B. laciniata*.

Uti prior, sed gracilior et glaberrima; capsula glabra, ... *B. megaptera*,

Herba robusta subsimplex, molliter paleaceo-pilosa; folia longipetiolata, non lobata; capsula paleaceo-pilosa, *B. barbata*.*

†† Stamina monadelphæ. Maris perianthium 5-lobatum, femineum 5-6-lobatum; capsulæ inæquali-3-alatæ.

|| Folia et inflorescentia radicalis, illa in petiolum 2-3 lin. longum contracta, ciliata, supra hispida; flores poll. fere in diametro, candidi, ... *B. nivea*.

||| Inflorescentia axillaris v. e basi folii orta, v. prolifica e gemma axillari.

O Non prolifica. Folia alterna v. verticillata, raro numero ad solitarium reducta. Flores parvi, albi.

Glabra; folia alterna, petioli 1-2 lin. longi, *B. procridifolia*.

Glabra; folia verticillata, longius petiolata, *B. verticillata*.

Caules petiolique pubescentes; inflorescentia glabra; folia alterna, longipetiolata, supra sparse hirtula, *B. Martabanica*.

* Planta Burmanica, floribus roseis gaudens, ab Assamica paullo differt capsulis majoribus crassioribus magis pilosis.

OO. Prolifica, folio solitario radicali v. foliis paucis alternatis. Flores parvi, albi.

Magis minusve stellato-velutina; inflorescentia glabra; folia alterna v. raro solitaria, *B. sinuata*.

Glabra; folium solitarium, pedunculis 2 v. pluribus ex ipsius basi ortis, *B. prolifera*.

Caules &c., et inflorescentia conspicue bracteata, paleaceo-pilosa, sæpius pilis glandulosis intermixtis, *B. paleacea*.

† † † Stamina monadelpha; perianthium utriusque sexus 2-sepalum, apetalum.

Herba tenerima; folia alterna, supra minute et sparse pilosa; flores parvi, *B. flaccidissima*.

* * Styli 3, liberi v. connati; capsulæ 3-loculares et 3-alatæ.

† Placentæ integræ.

Glabra; inflorescentia radicalis v. subradicalis; folia radicalia profunde lobata; perianthium 2-sepalum, apetalum, *B. Brandisiana*.

† † Placentæ bifidæ.

O Herbæ caulescentes foliis caulinis alternatis.

Partes omnes et inflorescentia glabra; capsulæ 3 lin. longæ, alis apice truncatis; stamina monadelpha, *B. parvuliflora*.

Folia supra sparse setulosa et nitida, cæteris præcedenti assimilis, at capsulæ $\frac{1}{2}$ poll. longæ; stamina libera, antheræ mucronulatæ; styli liberi, *B. modestiflora*.

Uti præcedens, sed folia opaca et pilosiora; stamina monadelpha, antheræ connectivo truncato lato terminatæ; styli ad medium connati, *B. scutata*.

Folia minute et sparse pilosula; inflorescentia glanduloso-puberula; stamina monadelpha, capsulæ alæ semisagittatæ basi in lobos obtusos productæ, *B. surculigera*.

OO. Herbæ scapigeræ, foliis et inflorescentiis radicalibus et vulgo solitariis.

Folia longissime petiolata, basi peltata, papilloso-punctata et glabra, *B. subperfoliata*.

Folia longissime petiolata, cordata, nec peltata, supra papillosa et minute pilosula; stamina libera, *B. velutina*.

ERICACEÆ.

159. VACCINIUM VERTICILLATUM, Kurz, non Wight. (*Agapetes verticillata*, D. Don, Gen. Syst. III. 862.; DC. Prod. VII. 554).

Frutex epiphyticus, 2-3 pedalis, glaber; folia obovato-lanceolata ad subcuneato-lanceolata, petiolo brevissimo crassissimo, v. subsessilia, basi attenuata rotundata v. obtusa, $2\frac{1}{2}$ - $3\frac{1}{2}$ poll. longa, obtusiuscula v. breviter acuminata, coriacea, integra v. apicem versus obsolete et remote serrata, glabra, nervis

seculus marginem anastomozantibus; flores speciosi, coccinei v. miniati, tubulosi, $\frac{2}{3}$ ad $1\frac{1}{2}$ poll. longi, pedicellis subpollicaribus, glanduloso-hirsutis suffulti, umbellam v. potius racemum abbreviatum pauciflorum axillarem formantes v. solitarii v. fasciculati; calyx 5-dentatus, glanduloso-hirsutus, dentibus lanceolatis acutis lin. circiter longis; corolla glabra, 5-gona, lobis lineari-lanceolatis obtusis; filamenta 2 lin. fere longa; antheræ c. 3 lin. longæ, granulato-tuberculatæ, in tubos rigidos plus quam poll. longos productæ; stigma parvum, truncatum v. sub-5-lobo-peltatum; baccæ glanduloso-hirsutæ, pedunculi apice subcyathiformi-incrassato insidentes, calycis limbo coronatæ.

Var. *a. genuinum*, corolla $\frac{3}{4}$ poll. tantum longa; flores in racemos umbelliformes brevipedunculatos dispositi. (*Thibaudia obliqua*, Griff., Icon. Dicot. t. 515).

Var. *β. elegans*, corolla præcedentis sed flores solitarii v. 2-3-ni fasciculati axillares; folia vulgo latiora.—*Pegu*.

? Var *γ. grandiflorum*, corolla duplo longior, flores in racemos umbelliformes breve pedunculatos v. sessiles collecti, rarius solitarii.—*Martaban, Tenasserim*.

N. B.—*V. verticillatum*, Wight, Ic. t. 1181. ad *V. setigerum* (*Agapetes setigera*, Don) pertinet.

160. VACCINIUM VARIEGATUM (*Agapetes variegata*, Don, Gen. Syst. III. 862; *Ceratostemma variegatum*, Roxb. Fl. Ind. II. 413; Griff. Icon. Dicot. t. 502; *Thibaudia variegata*, Royle, Ill. Him. Pl. t. 79, f. 1.).

Frutex epiphyticus, 2-3 pedalis, glaber; folia lanceolata ad obovato-lanceolata, acuta v. breviter acuminata, petiolis brevissimis crassis, v. subsessilia, basi acuta v. obtusa, 2-3 poll. longa, coriacea, apicem versus obsolete repando-serrata, glabra, nervis secus marginem anastomozantibus; flores coccinei, pedicellis gracilibus glabris sursum cyathiformi-incrassatis suffulti, in racemos umbelliformes axillares v. supra foliorum delapsorum cicatricibus ortos pedunculatos glabros dispositi, v. rarius fasciculati v. solitarii; corolla glabra, poll. fere longa, tubulosa, lobis obtusiusculis; calyx glaber, 5-fidus, lobis oblongis lanceolatis c. 2 lin. longis acutis sæpius obsolete costatis et penninerviis; antheræ granulato-tuberculatæ, filamentis brevissimis suffultæ, in tubos $\frac{2}{3}$ - $\frac{3}{4}$ poll. longos productæ; stigma truncatum; baccæ glabræ, rubræ, calycis limbo coronatæ.

Variat: *a. macranthum* (*Ceratostemma variegatum*, Roxb. et Wight; *Thibaudia macrantha*, Hook., Bot. Mag. t. 4566.) flores c. 2 poll. longi v. longiores, variegati.—*Tenasserim*.

Var. *β. parviflora* (*Thibaudia variegata*, Royle) flores dimidio minores, miniati v. coccinei.—*Martaban*.

161. *VACCINIUM MINIATUM* (*Oeratostema miniatum*, Griff. Icon. Dicot. t. 504.)

Frutex epiphyticus glaber; folia oblongo-lanceolata ad oblonga, acuta v. acuminata, petiolis brevissimis crassis, v. subsessilia, basi subinæquali rotundata, 4-5 poll. longa, acuta v. acuminata, repando-serrulata, coriacea, glabra, subtus nervis numerosis et prominentibus, secus margines evanescentibus, laxè et prominenter reticulata; flores coccinei, racemos breves umbelliformes glabros axillares v. laterales efficientes, raro pauci et fasciculati; calyx glaber; corolla glabra, 5-gona, c. $\frac{3}{4}$ poll. longa, lobis brevibus linearibus acutis; filamenta brevissima, antheræ tubo inclusæ, granulato-tuberculatæ, tubis strictis nudis paullulo breviores; baccae desunt.—*Ava?* (Griff.)

162. *VACCINIUM CAMPANULATUM*, nov. sp.

Frutex epiphyticus, glaber, ramulis subangulatis; folia obovato-oblonga ad lanceolata, obtusa v. obtusiuscule acuminata cum mucrone, petiolis brevissimis et crassis v. subsessilia, 2-3 poll. longa, basi acuta v. obtusa, integra v. subintegra, marginibus recurvis, coriacea, glabra, nervis tenuibus secus marginem liberis, laxè reticulata; flores coccinei, sæpius variegati, pedicellis gracilibus glabris suffulti, in racemum gracilem sed brevem glabrum sæpius e ramis ortum dispositi; calyx glaber, limbo cyathiformi argute sinuato-5-dentato; corolla glabra, c. $\frac{1}{2}$ poll. longa, v. paullo longior, 5-angularis, campanulata, lobis longis lanceolatis acuminatis reflexis; filamenta brevissima; antheræ granulato-tuberculatæ, loculis in tubos strictos anthera ipsa sublongiores dorso basi refracto-setosos terminatis.—*Martaban.*

163. *VACCINIUM MACROSTEMON*, nov. sp.

Frutex epiphyticus, 2-4 pedalis, glaber; folia cum basi crassa rotundata v. obtusa subsessilia, obovato-lanceolata ad lanceolata, acuminata, 3-5 poll. longa, marginibus integris recurva, coriacea, glabra, nervis tenuibus marginem versus liberis, tenuiter et laxè reticulata; flores coccinei, pedicellis gracilibus glabris in racemos magis minusve elongatos glabros subulato-bracteatos solitarie v. geminatim supra foliorum delapsorum axillis ortos dispositi; calyx glaber, limbo cyathiformi, lobis longe subulatis; corolla c. $1\frac{1}{4}$ poll. longa, glabra, subcurvo-tubulosa, lobis lineari-lanceolatis reflexis; filamenta glabra, gracilia, c. $\frac{1}{2}$ poll. longa v. longiora; antheræ breviusculæ, connatæ, læves, loculis in tubos strictos anthera longiores productis; baccae fusiformi-ovoideæ, apice angustatæ et calycis limbo cyathiformi coronatæ.—*Martaban.*

164. *VACCINIUM PUMILUM*, nov. sp.

Frutex ramosissimus, parvus, epiphyticus, novellis pubescentibus; folia oblonga ad lanceolato-oblonga, petiolo brevissimo puberulo, basi acuta, obtusiuscula, crenulata, crasse coriacea, c. poll. longa v. breviora, subtus (in vivo albidi) pallida, nervis obsoletis; flores parvi, pedicellis brevissimis pube-

ruilis, in racemos (2 v. 1) terminales pubescentes bracteatos digesti; bracteæ deciduæ, albæ, membranaceæ, foliaceæ, ovatæ, puberulæ et ciliatæ; calyx pubescens, dentibus oblongo-lanceolatis, acutis, ciliatis; corolla c. 2 lin. longa, oblongo-urceolata, lobis brevissimis reflexis, 5-gona, extus glabra, intus inprimis ad faucem dense villosa, rosea; filamenta brevina, filiformia, apice pilosa et barbata; antheræ glabræ, loculis in tubum brevem lanceolato-subulatum basi bisetosum desinentibus; baccæ parvæ, purpureæ, glabræ, calycis limbo coronatæ.—*Martaban.*

165 VACCINIUM EXARISTATUM, nov. sp.

Frutex magnus, sæpius in arbusculam excrecens, novellis pubescentibus; folia oblongo-lanceolata ad oblongo-ovata, petiolis puberulis brevibus suffulta, basi acuta v. obtusiuscula, $1\frac{1}{2}$ - $2\frac{1}{2}$ poll. longa, acuta v. breve acuminata, subtus dum juvenilia parce pubescentia, glabrescentia, chartacea, serrulata, penninervia et inconspicue reticulata; flores albi, pedicellis $1-1\frac{1}{2}$ lin. longis puberulis, racemum secundum gracilem puberulum axillarem formantes; bracteæ coccineæ, deciduæ; calyx puberulus v. subglaber, lobis triangulari-acutis, corolla $2-2\frac{1}{2}$ lin. longa, glabra, urceolata, lobis reflexis brevibus; filamenta pilosa, basi dilatata; antheræ tubis brevibus et setis destitutis terminatæ; baccæ globosæ, glabræ, rubræ, calycis limbo coronatæ.—*Martaban.*

Var. a. semipubescentis, calyx glaber v. subglaber.

Var. β. pubescens, calyx pubescens.

PRIMULACEÆ.

166. LYSIMACHIA LINEARIFOLIA, Griff., MS. in Hb. Griff. 3532.

Herba annua, erecta, stricta, glabra, caulibus teretibus v. subteretibus simplicibus ped. circiter altis; folia alterna, linearia ad lineari-lanceolata, utrinque acuminata, $1-1\frac{1}{2}$ poll. longa, petiolo gracillimo sed brevi suffulta, integra, membranacea, glabra; flores parvi, solitarii v. geminati, axillares, longe pedunculati; calycis segmenta lineari-subulata, plus quam lineam longa; pedunculi fructigeri graciles, c. $1\frac{1}{2}$ poll. longi.—*Ava?* (Griff.). *L. pedunculari*, Wall., affinis. *Lysimachia* sp. Griff. Not. Dicot. 299. t. 484, speciem mihi distinctam *L. Lobelioidi* affinem nomine *L. Griffithianæ* saluto.

MYRSINEACEÆ.

167. ARDISIA HELFERIANA, nov. sp.

Frutex? ferrugineo-tomentosus; folia obovato-oblonga ad oblonga, petiolis 3-4 lin. longis crassis dense ferrugineo-pubescentibus, breve acuminata, integra v. obsolete repando-dentata, 3-5 poll. longa, membranacea, utrinque ferrugineo-pubescentia, nervis lateralibus tenuibus et curvis; flores parviusculi, pedicellis $\frac{1}{2}$ -1 poll. fere longis ferrugineo-pilosis sustenti, racemum subumbelliformem ferrugineo-pubescentem pedunculo nudo 3-4 pollicari gracili

axillari suffulto formantes ; calyx ferrugineo-pilosus, lobis oblongo-lanceolatis, acutis, lineam circiter longis ; corolla glabra, lobis c. $2\frac{1}{2}$ lin. longis, oblongis, acutis ; drupæ desunt.—*Tenasserim* (Helf. 3589).

168. *ARDISIA SERRULATA*, nov. sp.

Frutex ? novellis tomento minuto ferrugineo obtectis ; folia lanceolata v. elliptico-lanceolata, basi in petiolum 5-8 lin. longum attenuata, breve acuminata v. acuta, repando-serrulata, basin versus integra, 4-6 poll. longa, tenuia et membranacea, glabra, parce punctata, nervis crebris approximatis, subparallelo-divergentibus et inconspicuis ; flores parvi, pedicellis gracilibus inæquali-longis ferrugineo-puberulis suffulti, densiuscule thyrsoidæ racemosi et paniculam terminalem v. ex axillis foliorum superiorum ortam amplam ferrugineo-puberulam bracteata formantes ; bractæ foliaceæ, lineari-lanceolatæ, 3-6 lin. longæ, subtus ferrugineo-lepidosæ ; bracteolæ minores, lineares ; calyx ferrugineo-puberulus, lobis linearibus acutis c. 1 lin. longis ; corolla subrotata, lobis ovatis acutis c. 2 lin. longis ; drupæ desunt.—*Ava* ? (Griff. 3562). Inter *A. neriifoliam* et *A. floribundam*, Wall., intermedia.

169. *ARDISIA RIGIDA*, nov. sp.

Frutex ? novellis probabiliter indistincte ferrugineo-lepidotis ; folia oblongo-lanceolata, in petiolum 4-6 lin. longum crassum attenuata, breve et obtusiuscule acuminata, pergamacea, integra, 6-9 poll. longa, glabra, punctata, nervis subtus prominentibus et subparallelis ; flores...parvi, pedicellis $\frac{1}{2}$ - $\frac{3}{8}$ lin. longis crassis minute ferrugineo-puberulis nutantibus suffulti, paniculam terminalem compositam rigidam robustam ferrugineo-puberulam efficientes ; calyx minute et indistincte puberulus, lobis ovatis acutiusculis, vix $\frac{1}{2}$ lin. longis, ciliolatis ; corolla... ; drupæ immaturæ globosæ, glabræ.—*Tenasserim* or *Andamans*. (Helf. 3563).

170. *MESA MUSCOSA*, nov. sp.

Frutex ramis teretibus lævibus nitidisque, ramulis... ; folia oblonga ad obovato-oblonga, basi acuta v. acuminata, petiolis $\frac{1}{2}$ -1 poll. longis validis parce puberulis, breve acuminata, grosse sinuato-dentata, pergamacea, 5-7 poll. longa, glabra, costa subtus parce puberula, nervis secus margines in denticula callosa obtusa excurrentibus ; flores minuti, 5-meri, pedicellis brevissimis pubescentibus suffulti, breve racemosi, in paniculam axillarem quasi muscosam petiolis 2-3-pl. longiorem ferrugineo-pubescentem digesti ; bractæ lin. circiter longæ, pedicellis longiores, ferrugineo-hirsutulæ, lineari-acuminatæ ; bracteolæ ? ; calyx ferrugineo-hirsutus, lin. fere longus, lobis ovato-lanceolatis acutis ; corolla tubuloso-campanulata, glabra, calyce duplo longior, lobis brevibus rotundatis ; ovarium sub-inferior ; stylus calycis lobos longitudine haud attingens.—*Burma* (Griff. 3556). Ex affinitate *M. mollissi*.

mæ. *M. permollis*, species olim a me in hocce diario descripta (cf. 1871, p. 66) nunc formam extremam latifoliam *M. mollissimæ*, Wall., habeo. Formas intermedias inter ambas species nuper in Burmania haud raro observavi.

SAPOTACEÆ.

171. *ISONANDRA CALOPHYLLA*, Kurz, in Journ. As. Soc. Beng. 1871. 69.

Arbor mediocris, novellis dense adpresse ferrugineo-pubescentibus; folia elliptica v. elliptico-oblonga, petiolis 4-5 lin. longis cupreo-puberulis glabrescentibus, breve acuminata, integra, marginibus recurvulis, 4-7 poll. longa, chartacea, minute ferrugineo- v. cupreo-sericea glabrescentia, supra nitida, nervis lateralibus prominentibus validis, transverse tenui-venosa; flores nondum reperti; fructus pruni magnitudinis, pedunculo nutante, 1-1½ pollicari subglabro axillari sustenti, elliptico-ovati, apiculati, dense ferrugineo-puberuli, 1-2-spermi, basi calyce persistente 6-partito lobis ovatis supportati; semina semi-oblonga, 1½ poll. fere longa, lucida, brunnea.—*Andamans.*

EBENACEÆ.

172. *GUNISANTHUS MOLLIS*, nov. sp.

Arbuscula ramis novellisque brunneo-pubescentibus; folia petiolo brevissimo (c. 1 lin.) suffulta, anguste oblonga v. oblongo-lanceolata et sæpius basin obtusam versus subangustata, obtusiuscule acuminata, 3-4 poll. longa, chartacea, supra secus costam et subtus omnino molliter pubescentia; flores ochracei, extus dense pubescentes, pedicellis 4-6 lin. longis pilosis suffulti, racemos breviusculos pilosos efficientes; calycis lobi lineari-lanceolati, c. 3 lin. longi, tubo multo breviores; corollæ lobi tubo calycino paullulo longiores, feminei fructusque adhuc ignoti. *Diospyros mollis*, Kurz MS. olim.—*Martaban.*

173. *DIOSPYROS SAPOTOIDES*, nov. sp.

Arbor mediocris, novellis parce ferrugineo-pubescentibus mox glabrescentibus; folia elliptico-oblonga ad elliptica, basi obtusa, petiolo vix semipollicari glabrescente crasso suffulta, 6-8 poll. longa, breve et obtusiuscule acuminata, integra, coriacea, reticulatione laxissima subtili et immersa percursa; flores hermaphrodito-feminei 4-meri, flavescenti albi, iis *D. sapotæ* assimilés, subsessiles, glomerati, pedunculo crassissimo axillari brevissimo; calyx extus ferrugineo-pubescentis, lobi ovato-lanceolati marginibus reflexi et basi auriculato-complicati, 3 lin. fere longi, acuminati; corollæ tubus urceolatus, calyce sub-duplo longior, extus ferrugineo-pubescentis, lobis obovatis tubi fere longitudinis; stamina c. 12, tubo basi inserta, glabra, inæqualia; antheræ ovato-lanceolatæ, acuminatæ; filamenta filiformia, glabra; ovarium ovatum, glaberrimum, stylo moderate longo 4-fido; flores masculi fructusque desunt.—*Pegu.*—*D. undulatæ* arcte affinis, sed ovario glaberrimo discrepat.

*STYRACACEÆ.*174. *SYMPLOCOS PEDICELLATA*, nov. sp.

Arbor mediocris subgracilis, novellis sparse adpresse sericeis; folia elliptico-lanceolata ad lanceolata, in petiolum 4—5 lin. longum gracilem glabrum attenuata, subcaudato-acuminata, obsolete crenato-serrulata, 4-5 poll. longa, tenuiter pergaminea, glabra, opaca, nervis et reticulatione laxa subtilibus; flores ignoti; racemi graciles compositi paniculam depauperatam subsessilem minute adpresse pubescentem axillarem v. supra foliorum delapsorum cicatricibus ortam efficientes; bracteæ casæ; bracteolæ $\frac{1}{2}$ lin. vix longæ, minutæ, ovato-acutæ, glabræ, deciduæ; pedicelli vulgo 2 lin. longi, minute adpresse pubescentes; baccae immaturæ ovoideæ, 3-4 lin. longæ, læves, teretes, calycis limbo coronatæ, putamen pergamaceum monospermum includentes; calycis lobi sub fructu lato-ovati, obtusi, c. $\frac{1}{3}$ lin. longi, glabri. *Martaban*.—*S. lucidæ*, Wall., affinis, pedicellis distinguitur.

175. *SYMPLOCOS LEIOTACHYA*, nov. sp.

Arbor v. frutex subglaber; folia elliptico-lanceolata ad lanceolata, petiolis 3-4 lin. longis sparse hirtis suffulta, acuminata, crenato-serrulata, 2-4 poll. longa, subchartacea, supra lucida, subtus secus costam validam nervosque parce adpresse pubescentia, nervatione tenui et inconspicua percursa; flores parvi, pedicellis gracilibus 1-1 $\frac{1}{2}$ lin. longis glabris suffulti, racemos numerosos graciles simplices glabros ex apice ramorum orientes efficientes; bracteæ pedicelli basi insertæ, lin. circiter longæ, lanceolatæ, acutæ, glaberrimæ; bracteolæ sub calyce 2, bracteis subconformes sed minutæ; calyx lævis, lobis ovatis obtusis, c. $\frac{2}{3}$ lin. longis; corolla rotata, lobis ovato-oblongis, obtusis, c. 1 $\frac{1}{2}$ lin. longis; stamina numerosa, inæqualia, basi tubo brevissimo inserta; baccas nondum vidi.—*Tenasserim* (Helf-3656).

176. *SYMPLOCOS LEUCANTHA*, nov. sp.

Arbuscula glabra; folia oblongo ad elliptico-lanceolata, basi sub-inæqualia, petiolo 2-3 lin. longo inserta, breve et obtusiuscule acuminata, 3-4 poll. longa, crenulato-dentata, chartacea, glabra; flores albi, fragrantés, pedicellis brevissimis vix $\frac{1}{2}$ lin. longis crassis canescenti-tomentosis suffulti; racemi breves, tomentosi, axillares, bracteis nonnullis ovatis extus pubescentibus caducis sustenti; calyx glaberrimus v. ejus lobi ovati obtusi extus pubescentes, ciliolati, c. 2 lin. longi; petala obovato-oblonga, calycis lobis duplo longiora; stamina glabra, inæqualia, 5-adelpha, phalangibus basi loborum insertis; ovarium stylusque longus parce pubescens; drupa non visa.—*Pegu*. Ex affinitate *S. cratægoidis*, Don.

*APOCYNÆÆ.*177. *TABERNÆMONTANA OPHIORRHIZOIDES*, nov. sp.

Frutex 2-4 ped. altus, glaber; folia obovato-oblonga ad lato-lanceolata in petiolum brevissimum (2-3 lin.) attenuata v. foliorum nonnulla subsessi-

lia, breve acuminata, 3-5-poll. longa, integra, membranacea, glabra, subtus pallida; flores pedicellis $1-1\frac{1}{2}$ lin. longis suffulti, cymas 3, v. raro 2, v. plures breve pedunculatas, v. nonnunquam subsessiles, glabras paucifloras in ramulorum superiorum furcationibus sitas efformantes; calyx glaber, brevissimus, 5-fidus, segmentis lineam vix longis, lanceolatis, acutis; corollæ tubus subcrassus, c. 4 lin. longus, apice inflatus, lobis tubo vix dimidio brevioribus; folliculi... —*Martaban.* *T. rostratæ*, Wall., affinis videtur, a qua inter alia corolla duplo brevior differt.

178. *TABERNÆMONTANA MEMBRANIFOLIA*, nov. sp.

Frutex 3-4 pedalis, glaber; folia lanceolata ad lato-lanceolata, in petiolum 3-5 lin. longum attenuata, 3-5 poll. longa, longe et graciliter acuminata, integra, membranacea, glabra, subconcolora; flores albi, pedicellis gracilibus 4-6 lin. longis glabris inserti; cymæ vulgo binæ, breve pedunculatæ, dichotomo-ramosæ, glabræ, laxæ, corymbiformes in ramulorum superiorum furcationibus sitæ; bracteæ nullæ v. minutæ et deciduæ; calyx minutus, lobis lineari-subulatis, lineam vix longus; corollæ tubus gracilis $\frac{3}{4}$ poll. longus, infra medio circa antheras leviter inflatus, lobi lineari-lanceolati, acuminati, tubo dimidio circiter breviores; folliculi desunt.—*Martaban.* *T. subcapitatæ*, Wall., affinis, sed calyce jam distincta.

BIGNONIACEÆ.

179. *SPATHODEA VELUTINA*, nov. sp.

Arbor, novellis fulvo-puberulis; folia impari-pinnata, $1-1\frac{1}{2}$ ped. longa, petiolo glabro striato basin versus 1-2 foliolis diminutis stipuliformibus munita; foliola 4-juga cum impari longe petiolato, basi inæqualia, sessilia v. subsessilia, oblongo-lanceolata, acuminata, 4-6 poll. longa, serrulata, membranacea, glaberrima; inflorescentia deest; calyx spathaceus, recurvato-acuminatus, extus fulvescenti-velutinus, c. $1\frac{1}{2}$ poll. longus; corolla c. 3 pollicaris, campanulato-infundibuliformis, glabra, tubo pollicari constricto, filamenta glabra, tubo supra constrictione inserta; capsula deest.—*Ava, Pegu* (Dr. Brandis).

180. *HETEROPHRAGMA SULFUREA*, nov. sp.

Arbor mediocris decidua, novellis tomento fugaceo canescenti-villoso obductis; folia impari-pinnata, 2-3 ped. longa, rachi petioloque fugaciter floccoso-tomentoso; foliola 4-5-juga cum impari longe petiolato, elliptica et ovato-elliptica ad ovalia, juniora obtusiuscule apiculata v. obtusiuscula et obsolete serrata, basi rotundata v. obtusa, sessilia v. brevissime petiolulata, 4-6 poll. longa v. longiora, chartacea, parce puberula, supra mox glabrescentia; flores sulfurei, conspicui, pedicellis cinerascenti- v. flavescenti-tomentosis 3-4 lin. longis suffulti, paniculas breves terminales dense tomentosas efficientes; calyx $\frac{1}{2}-\frac{3}{4}$ poll. longus v. brevior, campanulatus, usque ad medium fissus,

distincte 3- v. 2-lobatus v. dentatus, extus cinerascenti-tomentosus, intus glaber; corolla infundibuliformis, glaberrima, tubo pollicari v. longiori, lobi patentes tubo plus quam duplo longiores, undulato-crispati; capsulae usque 2 pedales, iis *Spathodea stipulata* assimiles, elongato-lineari-oblongae, compressiusculae, dense funoso-tomentosae, septo brevi et valde reducto, medio septi instar dilatato; semina elongato-membranaceo-alata, c. 2 poll. longa.—*Prome, Pegu.*

181. *SPATHODEA IGNEA*, Kurz, in Journ. As. Soc. Beng. vol. XL, p. 77 descripta, potius generis novi typum praebet, calyce tantum usque ad medium fissio circumscisse deciduo spathaceo, filamentis usque ad medium corollae adnatis, antherarum loculis parallelis, nec non foliis decompositis a *Spathodea* distingui potest et sub nomine *Mayodendri* (in honorem viri nobilissimi Ma y o, proregis infausti Indiae orientalis, dictum) in narratione mea officiali de sylvis Burmanicis fusius descripsi et iconibus illustravi.

182. *STEREOSPERMUM NEURANTHUM*, nov. sp.

Arbor mediocris, novellis molliter pubescentibus; folia impari-pinnata, juniora praesertim subtus pubescentia, 1-1½ ped. longa; foliola 3 v. 2-juga cum impari longe petiolato, basi subinaequali acuta v. obtusa, petiolulo crasso 1-2 lin. longo suffulta, obtusiuscula v. obtusiuscule apiculata, 2-4, nonnunquam usque ad 5-6, poll. longa, integra, rigide chartacea, juniora subtus canescenti-tomentosa denuo magis minusve scabrescentia, supra scabrescentia glabrescentia et subrugulosa; flores conspicui, pallide lilacini v. cyanescenti-albi, atropurpureo-venosi, pedicellis 4-7 lin. longis pubescentibus apicem versus bibracteolatis, in paniculam breviusculam subcymniformem pubescentem terminalem dispositi; calyx c. 4 lin. longus, pubescens, breviter 4-lobus; corolla campanulato-infundibuliformis, subcurva, puberula, lobis leviter undulato-crispatis; capsulae elongato-lineares, cylindrico-4-gonae, glabrae, 1-1½ ped. longae; semina et septum uti in *S. chelonioide*.—*Pegu.*

ACANTHACEAE.

183. *RUELLIA FLACCIDA*, nov. sp.

Herba debilis, pilosa, ramosa et suberecta, 1½-2 pedalis, caulibus longe et patenter pilosis; folia ovata, basi contracta et in petiolum gracilem pilosum ½-¾ poll. longum attenuata, obtusa, 1½-2 poll. longa, membranacea, obsolete crenato-dentata, praesertim supra parce pilosa; flores parviusculi, pallide caerulei, inter bracteas foliaceas obovato-oblongas obtusas v. emarginatas pilosas fimbriatas vulgo solitarii et sessiles; calyx 3 lin. fere longus, lobis linearibus, ciliatis et pilosis; corolla c. 6 lin. longa, tubuloso-infundibuliformis, glabra, tubo breviusculo, lobis brevibus rotundatis; stamina 4, filamenta longe pilosa; stylus simplex, 6 lin. fere longus, glaber; ovarium glabrum.—*Pegu.*

184. *RUELLIA MACROSIPHON*, nov. sp. (R. sp. T. And. in Linn. Proc. IX. 461 in nota).

Herba perennis? subsimplex, 2-3 pollicaris, caulibus hirsutis, novellis pilis albis crispis sublanuginosis; folia lineari-lanceolata v. linearia, c. 2 poll. longa, acuminata, in petiolum brevissimum attenuata, integra, membranacea, ciliata, utrinque præsertim secus nervos hirsutula; flores magni, solitarii, sessiles, bracteis 2 foliaceis pedunculum brevem axillarem terminantibus insidentes; bracteæ lineari-lanceolatae, calyce pluries longiores, structura et indumento foliis similes; calycis segmenta lineari-subulata, c. $2\frac{1}{2}$ poll. longa, minute puberula; corolla tubuloso-infundibuliformis, c. 2 poll. longa, extus parce pilosula, lobis magnis rotundatis, tubo pollicari gracili in corollæ partem efflatam sensim ampliata; stylus longissimus, parce hirsutus; stamina 4, subæquilonga, inclusa; filamenta gracilia, parce hirsuta.—*Prome*? (Col. Eyre). *R. suffruticosa*, Roxb., arcte affinis.

185. *STROBILANTHES (HEMIGRAPHIS) BURMANICA*, nov. sp.

Herba decumbens ramosissima pilis albis patentibus cum glanduliferis intermixtis vestita, cauli ramisque 4-gonis; folia ovata ad ovato-lanceolata, basi in petiolum $\frac{1}{2}$ -2 poll. longum pilosum angustata, obtusiuscula, $1\frac{1}{2}$ -2 poll. longa, membranacea, crenato-dentata, utrinque parce pilosa; flores pallide cyanei, passim solitarii et axillares, frequentius autem in spicas longiores v. breviores foliaceo-bracteatas pilosas pedunculatas axillares et terminales digesti; bracteæ ovato-lanceolatae, obtusiusculæ, integræ, parce pilosæ et longe ciliatæ, inferiores usque ad 7 lin. longæ; bracteolæ nullæ; calyx pilosus, segmentis linearibus 4 lin. longis; corolla rugata, 6 lin. circiter longa, glabra, ore pubescens, sensim in tubum attenuata, lobis obtusis rotundatis; antheræ 2-loculares, pallide violaceæ; filamenta crassa, piloso-barbata; stylus inæquali-2-fidus; capsulæ 4 lin. longæ, compresso-4-gonæ, obovato-lineares, acutæ, glabræ, a basi fere 8-spermæ; semina plus quam $\frac{1}{2}$ lin. in diametro, anguste marginata.—*Ava*, *Prome*, *Pegu*. *S. (Hemigraphidi) Pavalæ*, quacum cl. T. Anderson confudit, affinis.

186. *STROBILANTHES (HEMIGRAPHIS) GLANDULOSA* (*Hemigraphis glandulosa*, T. And. MS. in Kurz, And. Rep. App. B. 13.)

Herba ramosa, glanduloso-puberula; folia lanceolata v. oblongo-lanceolata, obtusiuscule acuminata, in petiolum glandulosum brevem attenuata, $2-2\frac{1}{2}$ poll. longa (superiora minora) repando-dentata, præsertim subtus secus costam glanduloso-puberula, supra glabrescentia; flores parviusculi, pulchre lutei, in axillis bractearum foliacearum vulgo solitarii, spicas 1 v. 2 axillares et terminales interruptas longe-pedunculatas foliaceo-bracteatas efformantes; bracteæ foliis caulinis similes sed multo minores, obtusæ, superiores sensim minores; bracteolæ calyce breviores, obovato-oblongæ, viscoso-hirsutæ; calycis segmenta lineari-spatulata, obtusa, glanduloso-hirta, c. $2\frac{1}{2}$

lin. longa; corolla c. 3. lin. longa, campanulato-infundibuliformis, tubo brevi extus puberulo intus lævi, lobis rotundatis; stylus et filamenta glabra; capsulæ clavatæ, compressiuscule 4-gonæ, calycis longitudine v. paullo longiores, apiculatæ, glanduloso-puberulæ, abortu vulgo 2-3-spermæ.—*Andamans.* Ex affinitate *S. (Henigraphis) Griffithianæ*.

187. *STROBILANTHES NEESII*, nov. sp.

Frutex magnus, 10-12 pedalis, ramulis puberulis glabrescentibus; folia lanceolata ad oblongo-lanceolata, breve acuminata, in petiolum $\frac{1}{2}$ -1 $\frac{1}{2}$ poll. longum attenuata, obsolete repando-dentata, 5-7 et sæpius usque ad 10 poll. longa, membranacea, utrinque pilis minutis adpressis adspersa, subtus secus costam puberula; flores majusculi, in spicas densas bracteatas sessiles denuo elongatas laxas interruptas axillares et terminales dispositi; bracteæ inferiores v. potius folia floralia foliaceæ, valde caducæ, c. $\frac{1}{2}$ poll. longæ v. longiores, setis brunneis ciliatæ, apicem versus fissæ et serratæ; bracteæ veræ oblongo-lineares, calyce breviores, apicem versus vulgo parce serratæ, acuminatissimæ, glanduloso-pilosæ; bracteolæ 2, calycis longitudine, lineari-lanceolatæ, acuminatæ, basi attenuatæ, glanduloso-hirsutæ; calycis segmenta c. 6 lin. longa, v. longiora, linearia, canescentia, ciliata, acumen versus sæpius glanduloso-hirsuta; corolla 1 $\frac{1}{2}$ -1 $\frac{1}{2}$ poll. longa, purpurea, extus glabra, intus fauce secus plicam duplicatam pubescens, tubo longo et gracili; stamina 2 (?); filamenta glabra, filiformia, alte adnata; stylus hirsutus; capsulæ lineari-clavatæ, calyce paullo longiores, glabræ, acumine parce hirtulæ, 4-spermæ; semina sericea.—*Martaban. S. fimbriatæ*, N. El., maxime affinis, sed indumento glanduloso nigrescente, corolla et filamentis glabris differt.

188. *STROBILANTHES FÆTIDISSIMA*, nov. sp.

Herba ramosa, caulibus divaricatis subteretibus, plus minusve dense fulvo-pilosa; folia ovata, basi in petiolum longum gracilem fulvescenti-pilosum attenuata, acuminata, membranacea, 3-5 poll. longa, serrato-dentata, utrinque albedo v. ochrascenti-hirsuta; flores cyanei, conspicui, spicam laxiusculam brevem albedo-pubescentem pedunculo brevi axillari dense fulvescenti-hirsuto suffultam v. subsessilem efformantes; bracteæ obovato-cuneatæ, c. 8 lin. longæ, obtusæ, herbaceæ, glanduloso-hirsutæ; bracteolæ bracteis conformes sed angustiores et subbreviores; calyx bractearum longitudine, adpresse glanduloso-puberulus, segmentis profunde lobulatis; corolla 1 $\frac{1}{2}$ poll. fere longa, glabra; filamenta glabra; stylus hirsutus; capsulæ c. 8 lin. longæ, glaberrimæ; semina fere 2 lin. in diametro, adpresse villosa.—*Martaban. S. rufescenti* affinis.

189. *STROBILANTHES PTEROCAULIS*, nov. sp.

Herba annua, robusta, erecta, ramosa, sparse hirsuta, caulibus crassiusculis quadrangulari-alatis, alis herbaceis dense fimbriatis; folia 8-12 poll.

longa, obovato-oblonga, basi angustato-cuneata ciliata in petiolum crassum brevissimum (2-3 lin.) decurrentia, breve acuminata, crenato-dentata, membranacea, utrinque plus minusve hirsuta; flores parvi, flavescentes, spicas breves dense bracteatas glandulosas 3-4-nas in paniculam axillarem dispositi; pedunculi et ramificationes acute 4-angulati, anguste alati, et dense hirsuto-ciliati; bracteae obovato-cuneatae, obtusae, 3-4 lin. longae, glanduloso-fimbriatae et apice pilis hyalinis articulatis glanduloso-hirsutae; bracteolae 2, calycis longitudine, obovato-linearia, apice glanduloso-hirsutae; calycis segmenta linearia, obtusiuscula, 3 lin. fere longa, hyalino-chartacea, apice parce glanduloso-hirsuta; corollae omnes caesae; capsulae calycis longitudine v. paululo longiores, lineari-oblongae, 4-angulares, apice hirsutae, 4-spermæ.—*Pegu. St. imbricata*, NE., affinis.

190. STROBILANTHES KARENSIUM, nov. sp.

Herba perennis, ramosa, magis minusve albo-hirsuta; folia caulina inferiora brevissime petiolata, superiora subsessilia, ovata, brevissime acuminata, membranacea, crenata, utrinque hirsuta, 2-3 poll. longa v. longiora; spicae breves, densiusculae, infra basi foliolis nonnullis floralibus subsessilibus hirsutissimis sustentae, pedunculo stricto hispido terminali v. axillari suffultae; bracteae lineares, c. 4 lin. longae, obtusiusculae, dense glanduloso-pubescentes; bracteolae lineari-subulatae, glanduloso-pubescentes; calyx subscariosus, bracteolarum longitudine, segmentis lato-linearibus albido-marginatis sursum pubescentibus; corolla cyanea, pollicem fere longa, glabra; filamenta secus partem adnatam hirsuta; capsulae bracteolarum longitudine, dorso pubescentes.—*Martaban*. Habitu *S. acrocephali*, characteribus essentialibus autem *S. glomeratae* proxima.

191. S. SUBFLACCIDA, nov. sp.

Herba gracilis, glabra, caulibus obsolete 4-gonis sulcatis; folia lanceolata ad oblongo-lanceolata, acuminata, basi in petiolum $\frac{1}{2}$ poll. longum attenuata, repando-dentata, flaccida, membranacea, 5-6 poll. longa, supra glabra subtus pilis minutis adpressis albidis adpersa; spicae dense et minute adpresse hirsutae; bracteae lato-obovato-oblongae ad oblongae v. obovato-lanceolatae, obtusissimae v. emarginatae, minute puberulae, enerviae, (purpureo?) coloratae, c. 2 lin. longae; bracteolae paullo breviores, minus obovatae, 1-nerviae, minute adpresse pubescentes; calyx bilabiatus, labio superiore glabro usque ad $\frac{1}{2}$, partem trilobo, lobis obtusis obsolete ciliatis, labio inferiore fere usque ad basin bifido, lobis linearibus obtusis, 1-nerviis extus minute pubescentibus; capsulae 2-2 $\frac{1}{2}$ lin. longae, calycem non superantes, clavato-oblongae, glabrae.—*Tenasserim*. (Helf. 6114).

192. STROBILANTHES DASYSERMA, nov. sp.

Herba erecta, ramosa, subglabra, 3-4 pedalis; folia inferiora magna, 6-8 poll. longa, oblongo-lanceolata ad lanceolata, basi cuneata in petiolum bre-

viusculum decurrentia, acuminata, serrato-dentata, membranacea, ciliata et supra pilis raris brevibus adspersa, subtus glabra et subglaucescentia; superiora caulina multo minora et basi magis rotundata, v. cordata, ovata, haud decurrentia, breve petiolata v. summa sessilia; flores cyanei, in capitula parva glanduloso-puberula pedunculata congesti, paniculam spuriam terminalem glanduloso-puberulam efformantes; bracteæ parvæ, oblongæ, acutæ, glandulosæ; calyx glandulosus, segmentis linearibus 3 lin. fere longis; corolla glabra, infundibuliformis, poll. fere longa; filamenta et stylus sparse pilosi; capsulæ calycis longitudine, obovato-4-gonæ, glanduloso-pubescentes, 4-spermæ, seminibus stuppeo-villosulis.—*Pegu.* Habitu *S. Bærhaavioïdis*, T. And., assimilis, floribus capitatis &c., autem in vicinitatem *S. pentstemonoidis*, T. And., referenda.

193. *BARLERIA STENOPHYLLA*, nov. sp.

Herba perennis, inermis, 1-1½ pedalis, subglabra, ramis erectis gracilibus, omnibus partibus plus minusve nitentibus; folia anguste linearia, 3-4 poll. longa, c. 2 lin. lata, spinescenti-acuta, subsessilia, coriacea, integra, supra adpresse hirsutula et sublucida; flores magni, sessiles, fasciculati, bracteati axillares et terminales; bracteæ lucidæ, rigidæ, ovato-lanceolatæ, pungenti acuminatæ, spinescenti-ciliatæ, extus secus costam adpresse hirsutæ; sepalâ exteriora oblonga, apice 2-fida, rigide ciliata, poll. fere longa, glabra; interiora brevissima, linear-lanceolata, adpresse pubescentia; corollâ circ. 2-pollicaris, puberula, cyanea?, tubo gracili sesquipollicari, lobis 8 lin. longis, rhomboideo-oblongis apiculatis crenatis; capsulæ desunt.—*Ava* (Dr. J. Anderson).

194. *NEURACANTHUS GRANDIFLORUS*, nov. sp.

Herba divaricata v. suberecta, subrigida, ramis retrorse-hirsutis v. lineis 2 v. 4 retrorse villosis notatis; folia parva, 1½-2 poll. longa, vulgo obovata v. oblonga, obtusiuscula v. breve acuminata, basi in petiolum brevissimum latum attenuata v. superiora subsessilia, obsolete dentata, membranacea, glaberrima; flores majusculi, pallide v. intense cyanei, spicas elongatas densas v. laxas subtetragonas hirsutas rigide-bracteatas ex foliorum axillis v. e rhizomate protrusas efficientes; bracteæ ovato-lanceolatæ, rigidæ, 5-nerviæ, pubescentes et hirsutæ, acuminatæ, pungentes; calyx bilabiatus, pubescens, secus segmenta linearia parce pilosus, prominenter 5-costatus; corollâ ½ poll. longa, rugata, lobis obtusis; capsulæ tetragono-lanceolatæ, acuminatæ, glabræ, 3 lin. longæ, 4-spermæ; semina sericeo-splendentia.—*Prome.*

195. *NEURACANTHUS SUBUNINERVIS*, nov. sp.

Herba erecta, probabiliter 1-2 ped. alta; folia adulta &c., ignota; flores albi, parvi, in spicas laxiuscule-bracteatas subtetragonas glandulosas et parce pilosas e rhizomate protrusas disgesti; bracteæ lanceolatæ, pungenti-acuminatæ, rigide membranaceæ, c. 3 lin. longæ, concavæ, medio prominenter

costatæ, costis autem 4 lateralibus obsoletis, glanduloso-puberulæ, secus nervos pilosæ; bracteolæ bractearum longitudine, falcato-lineares, sub-3-nerviæ, acuminatæ, glanduloso-puberulæ et piloso-ciliatæ; calyx profunde, fere usque ad basin, 5-fidus, nervis evanidis, glanduloso-puberulus et piloso-ciliatus, lobo superiore majore c. 4 lin. longo, lineari, acuto, lobis lateralibus paullo brevioribus, subulatis, 2 inferioribus basi tantum connatis et angustioribus; corolla alba, intus præsertim ad labellum brunneo-maculata, extus puberula, 4 lin. fere longa, tubo 2 lin. longo; labium superius emarginatum, marginibus reflexum, inferius 3-lobum, lobis oblongis rotundatis mediano sub-breviori; antherarum loculi compressi, barbata, obliquæ; filamenta brevissima, fauci-inserta; reliqua ignota.—*Prome.*

196. *LEPIDAGATHIS STROBILINA*, T. And. MS.

Herba 1-2-pedalis, glabra caulibus teretibus elevato-4-lineatis; folia lanceolata, basi cuneata in petiolo decurrentia, acuminata, membranacea, integra, 7-8 poll. longa, glabra et nitentia; capitula florum laxa, terminalia, majora; bractæ c. poll. longæ, oblongo-lanceolatæ, acuminatæ, tenuiter chartaceæ purpureo-lilacino-tinctæ, 1-nerviæ et reticulatæ, glanduloso-puberulæ; bracteolæ bracteis conformes, angustiores; calyx magnus; corolla magna, purpureo-lilacina, poll. fere longa, infundibuliformis, tubo brevi; capsulæ desunt.—*Martaban.* (Revd. Parish).

197. *JUSTICIA DASYCARPA*, nov. sp.

Herba ramosa, $1\frac{1}{2}$ pedalis, subglabra, caulibus sæpius lineis 4 hirtulis notatis; folia ovata, passim subobliqua, in petiolo gracili longo decurrentia, 3-5 poll. longa, breve acuminata, integra, membranacea; pilis minutis adpressis scabra; flores parvi, candidi, spicas breves laxè bracteatas solitarias axillares v. plures terminales efformantes; bractæ ovatæ ad ovato-orbiculares, brevissime acuminatæ, 3-4 lin. longæ, membranaceæ, virides, sparse ciliatæ; bracteolæ calyce paullo longiores, lineari-lanceolatæ, puberulæ; calyx $1\frac{1}{2}$ lin. longus, puberulus, lobis lineari-lanceolatis acuminatis; corolla $3\frac{1}{2}$ -4 poll. longa, labio superiore oblongo obtuso, inferiore 3-lobo; antheræ albæ; capsulæ fere 4 lin. longæ, clavatæ, dense puberulæ, 4-spermæ; semina verruculoso-aspera.—*Martaban.* *J. Atkinsonianæ*, T. And., affinis, sed floribus longe distat.

198. *JUSTICIA CALONEURA*, nov. sp.

Herba perennis, erecta, glabra, 2-3 pedalis; folia elliptico-oblonga ad lanceolata, acuta v. acuminata, basi cuneata et secus petiolum totum foliaceo decurrentia, 6-8 poll. longa, integra v. subintegra, membranacea, glabra v. subtus secus nervos laterales numerosos approximatos fugaciter adpresse puberula; spicæ glabræ, terminales, pedunculis brevissimis v. sessiles; bractæ decussatim oppositæ, sub-or biculares, acutæ v. apiculatæ, ciliatæ, c. $\frac{1}{2}$ poll. longæ, virides et nervosæ; bracteolæ lineari-lanceolatæ, acuminatæ; calycis

segmenta linearia, minute pubescentia; corolla $\frac{1}{2}$ poll. longa, extus puberula, intus secus filamentorum bases adnatas villosa, straminea, labio inferiori 3-lobo obscure-striato, labio superiore paullo longiore, concavo, 2-denticulato; capsulæ desunt.—*Martaban.* Præcedenti affinis.

199. *JUSTICIA FLAVA*, nov. sp.

Herba 2-3 pedalis, erecta, ramosa, subglabra, ramis (præsertim superioribus) 6-5-gonis, parce hirsutulis; folia ovata ad ovato-lanceolata, basi angustata et in petiolum longiorem v. breviorē indistincte hirsutum decurrentia, acuminata, 4-6 poll. longa, integra, membranacea, siccando nigrescentia, utrinque pilis raris brevibus adspersa; flores lutescentes, pedicellis brevissimis, in racemos breves cymæformes paucifloros glabros axillares petioli circiter longitudinis dispositi; bracteæ et bracteolæ remotæ, lineares, parvæ, glabræ; calyx glaber, c. $1\frac{1}{2}$ lin. longus, lobis lineari-lanceolatis, acuminatis; corolla c. $3\frac{1}{2}$ -4 lin. longa extus secus venas pubera, tubo brevi, labio superiore concavo, inferiore 3-lobo, faucem versus rugato, lobis rotundatis; filamenta glabra; anthera inferior calcarata; capsulæ clavatæ, tumidæ, acutæ, glabræ $\frac{1}{2}$ poll. fere longæ, 4-spermæ; semina minute rugulosa.—*Martaban.*

200. *DICLIPTERA SPECIOSA*, nov. sp.

Herba annua, erecta, ramosa, 1-3 pedalis, pilosa, caulibus sub-teretibus lineis 4 elevatis notatis plus minusve glabrescentibus; folia ovata ad ovato-oblonga et lanceolata, in petiolum pilosum v. substupposo-ciliatum 1-2 poll. longum decurrentia, breve acuminata, 5-7 poll. longa, integra, membranacea, utrinque pilis crispatis adspersa; flores albi, raro pallide cyanei, in cymas brachiatas longius v. brevius pedunculatas glanduloso-pubescentes v. pilosas congregati et paniculam magis minusve compositam efficientes; bracteæ obovato-lineares, obtusæ (v. in var. β acutæ), c. 3-4 lin. longæ; bracteolæ dimidio breviores, lineari-subulatæ; calyx bracteolis vix brevior, minute puberulus, segmentis subæqualibus, lineari-subulatis et minute ciliolatis; corolla 7-8 lin. longa, resupinata, tubo $2\frac{1}{2}$ lin. fere longo, labio superiori lineari-lanceolato, obtuso, lobo mediano brevi reflexo, labio inferiore 3-lobo, cymbiformi-complicato, lobis 2 lateralibus horizontaliter patentibus rotundatis; antheræ superpositæ, albæ; capsulæ lato obovato-cuneatæ, glanduloso-puberulæ, c. 4 lin. longæ, 4-spermæ; semina verruculis minutis flavescentibus aspera.—*Pegu.*

Var. a. genuina, bracteæ obtusæ, glanduloso-puberulæ; caules glabrescentes; corolla alba, labio inferiore coccineo-punctato; pedunculi glanduloso-puberuli, breviores (forma umbrosa).

Var. β . pilosa, caules, inflorescentia &c., patenter-pilosa; bracteæ lineares acutæ, pedunculi vulgo longiores; corolla præcedentis, raro pallide cyanea, intus atropurpureo-maculata, (forma arida, an species?)

Acanthacearum genera in regno Burmanico adhuc observata secundum systema Neesianum paulisper mutatum sic distinguenda :

Subord. I. THUNBERGIEÆ. *Calyx ad annulum dentatum v. nudum reductus.* Corolla 5-loba, subregularis. Antheræ 2-loculares, loculis parallelis. Semina globosa, placentæ cupulari insidentia. *Capsulæ rostratæ.*

1. *Thunbergia*, L. F. Genus unicum. Herbæ v. frutices scandentes raro suberecti.

Subord. II. ACANTHACEÆ. *Calyx bene evolutus, 5-partitus fidus v. dentatus, regularis v. irregularis.* Corolla varia. Antheræ 2 v. 1-loculares, loculis parallelis, obliquis v. superpositis. Semina compressa, raro globosa, retinaculis uncatis v. glanduliformibus sustenta. *Capsulæ non rostratæ.* Herbæ v. frutices sæpius erecti, raro scandentes v. prostratæ.

Trib. 1. ACANTHEÆ. *Calyx inæqualis.* Corolla fissa in labellum unicum magnum expansa. Antheræ 1-loculares, v. eæ paris inferioris oblique 2-loculares. Capsulæ a basi seminiferæ. Semina compressa, retinaculis uncatis sustenta.

* Corolla in labellum magnum expansa, lobis superioribus omnino suppressis v. rudimentariis, tubus brevissimus v. nullus.

2. *Acanthus*, L. Spicæ ∞ -floræ. Antheræ omnes 1-loculares.

2. *Blepharis*, Juss. Spicæ unifloræ; flores bracteis pluribus sæpius spinosis sterilibus circumdati. Antheræ paris inferioris 2-loculares.

** Corollæ tubus longus, limbus 5-lobus usque ad tubum fissus.

4. *Crossandra*, Salisb. Bractææ inermes, in acumen spinosam productæ.

Trib. 2. RUELLIEÆ. *Calyx magis minusve irregularis, sæpius bilabiatus.* Corolla infundibuliformis, hypocraterimorpha v. raro ringens. Stamina 4 v. 2; antheræ 2-loculares, loculis parallelis, rarissime obliquis (nec autem superpositis). Capsulæ basi sterili attenuatæ v. a basi seminiferæ. Semina compressa, retinaculis uncatis sustenta.

* *Barleria* Calyx 3-partitus, sepalis decussatis, 2 exterioribus sæpius majoribus. Capsulæ a basi seminiferæ.

5. *Barleria*, L. Corolla infundibuliformis. Stamina 4, raro 5, quorum 2 v. 3 sæpius sterilia et rudimentaria; antherarum loculi paralleli.

** *Neuracantha*. Calyx 5-fidus, irregularis, v. bilabiatus, v. segmento superiori tantum maximo. Corolla bilabiata

et ringens, v. infundibuliformis. Antherarum cellulae parallelæ v. obliquæ. Capsulae a basi seminiferæ.

- Calyx bilabiatus. Capsulae dissepimenta non secedentia. Spicæ rigidæ v. scariosæ, vulgo 4-stichæ.

6. *Neuracanthus*, N. E. Stamina 4; antherarum loculi obliqui. An potius cum genere sequenti conjungendum?

7. *Lepidagathis*, Willd. Stamina 4; antherarum loculi paralleli.

- Calycis segmentum superius maximum et bracteiforme. Capsulae dissepimenta in lamellas 2 seminifera secedentia.

8. *Phaylopsis*, Willd. Stamina 4; antherarum loculi paralleli. Spicæ breves bracteis membranceis mollibus vestitæ.

- *** *Ruellineæ*. Calyx 5-fidus, segmentis magis minusve inæqualibus. Corolla infundibuliformis. Stamina 4; raro 2. Capsulae magis minusve 4-gonæ, cum v. absque basi contracta sterili.

9. *Ruellia*, L.

10. *Hemigraphis*, N. E.

11. *Strobilanthes*, Bl.

} Genera inter se valde affinia postea a me accuratius eruenda.

Trib. 3. ERANTHEMEE. Calyx regularis, 5-dentatus v. 5-fidus. Stamina 2, raro 4; antheræ 2-loculares, loculis parallelis. Capsulae 2-4-spermæ, in basin longam sterilem contractæ. Semina compressa, retinaculis uncatis suffulta.

- Spicæ v. paniculae nudæ, i. e. bracteis minutis, persistentibus.

12. *Asystasia*, Bl. Corolla infundibuliformis, in tubum longiusculum v. rarius longissimum attenuata. Flores omnes fertiles. Capsulae vulgo 4-spermæ.

13. *Eranthemum*, L. Flores 2-5-morphi, fertiles minuti, clausi v. aperti; steriles speciosi, hypocraterimorphi, limbo subregulari tuboque longissimo.

- Spicæ foliaceo-bracteatae, bracteis nonnunquam deciduis.

14. *Daedalacanthus*, T. And. Corolla contorta, hypocraterimorpha, limbo regulari explanato v. complicato, capsulae vulgo 4-spermæ.

15. *Ecbolium*, Kurz. Corolla imbricata, hypocraterimorpho-bilabiata limbo irregulari, labio superiori reflexo lineari. Capsulae vulgo 2- raro abortu 1-spermæ, (ovuli in ovarii loculis semper 2).

Trib. 4. JUSTICEAE. Calyx regularis. Corolla ut plurimum ringens v. bilabiata. Stamina 2; antheræ 2-loculares, loculis superpositis. Capsulae compresso 4-gonæ, in basin sterilem contractæ. Semina plana, retinaculis uncatis suffulta.

- O Corollæ tubus longus, gracilis, limbi lobos longitudine superans.
16. *Rhinacanthus*, *N. E.* Limbi labium superius angustum, erectum. Antherarum loculi haud calcarati.
OO Corollæ ringentis tubus brevis.
17. *Justicia*, *L.* Antherarum loculi inferiores basi mucronati et calcarati. Capsulæ dissepimenta persistentia.
18. *Rungia*, *N. E.* Characteres præcedentis, sed capsulæ dissepimenta a valvis secedentia.
OOO Corolla bilabiata, tubo gracili longitudine loborum v. brevior.
19. *Dicliptera*, *Juss.* Capsulæ dissepimenta a valvis secedentia.
20. *Peristrophe*, *N. E.* Capsulæ dissepimenta persistentia.

Trib. 5. APHELANDREÆ. *Calyx regularis.* Corolla bilabiata, Stamina 4; *antheræ 1-loculares*, lineares v. oblongæ. Capsulæ vulgo a basi seminifera. Semina plana, retinaculis uncatis suffulta. Fere omnes Americanæ, inter Indica genus unicum (*Hypæstes*) hic rite referendum, cætera genera hic relata abnormalia esse videntur, viz. *Monothecium* (*Justiciæ* sect. *Rostellariæ* nimis affine) et *Hypæstes triflora*, Roem. et Schult., calyce a congeneris valde discrepans potius generi *Dicliptera* adnumeranda, v. generis novi typum præbens. *Haplanthi* genus infra inter *Hygrophileas* quærendum.

- Trib. 6. HYGROPHILÆ. *Calyx regularis v. irregularis, 5-fidus v. -dentatus.* Corolla bilabiata ringens. Stamina 2 v. 4; *antheræ 2-loculares*, loculis parallelis. *Capsulæ planiusculæ v. cylindricæ, sæpius striatæ, sulcatæ v. medio impressæ, a basi seminiferæ.* Semina compressa, retinaculis uncatis suffulta.
O Corolla infundibuliformis et subringens. Capsulæ cylindricæ v. subcylindricæ. Stamina 4 v. 2.
21. *Phlogacanthus*, *N. E.* Capsulæ 8-∞-spermæ; stamina 4, fertilia.
22. *Cystacanthus*, *T. And.* Characteres præcedentis, sed stamina fertilia 2, cum 2 rudimentariis.
23. *Graptophyllum*, *N. E.* Capsulæ 4-spermæ. Stamina 4, omnia fertilia.
OO Corolla ringens. Stamina 2. Capsulæ planiusculæ, sursum sæpius latiores.
* *Antheræ* basi sæpius barbatae v. villosæ. Racemi v. paniculæ nudæ.
24. *Andrographis*, *Wall.* *Antheræ 2-loculares.*

25. *Haplanthus*, *N. E.* Antheræ 1-loculares.
 ** Antheræ nudæ.
26. *Hemiadelphis*, *N. E.* Spicæ conspicue bracteatae.
 OOO Corolla bilabiata v. ringens. Stamina 4. Capsulæ magis minusve teretes, sæpius sulcatae.
27. *Hygrophila*, *R. Br.* Calyx tubulosus, regularis. Corolla bilabiata.
28. *Nomaphila*, *Bl.* Calyx usque ad basin 5-fidus. Corolla ringens.
- Trib. 7. *NELSONIÆ.* Calyx 5-fidus, ut plurimum subirregularis. Corolla infundibuliformis v. personata. Stamina 2 v. 4; antheræ 2-loculares, loculis parallelis. Capsulæ a basi seminifera. Semina minuta, *globosa, retinaculis glanduliformibus suffulta, v. iis omnino deprivata.*
 O Stamina 2.
29. *Nelsonia*, *R. Br.* Corolla ringens.
 OO Stamina 4.
30. *Ebermaiera*, *N. E.* Corolla ringens.
31. *Cardianthera*, *Ham.* (*Adenosma*, *N. E.* non *R. Br.*) Corolla personata.

VERBENACEÆ.

201. *VITEX CANESCENS*, nov. sp.

Arbuscula 25—35 pedalis, partibus omnibus junioribus canescenti v. gilvescenti-pubescentibus; folia digitatim 3—5—foliolata, petiolo 1—2—pollicari tomentello suffulta; foliola sæpius breve (intermedio multo longius) petiolulata, ovata v. ovato-lanceolata, ad elliptica et elliptico-lanceolata, acuminata v. acuta, basi attenuata, integra, v. raro crenato-serrata, membranacea, juniora utrinque dense canescenti-pubescentia, supra denuo scabrescenti-puberula; flores albi, parvi, pedicellis gracilibus 1—2 lin. longis tomentellis suffulti, glomerati, paniculas cinereo- v. gilvescenti-tomentellas compositas v. simplices terminales et supra foliorum delapsorum ortas efficientes; calyx cinereo-pubescent, lin. circiter longus, 5-dentatus; corolla calyce duplo longior, extus tomentosa; drupæ obovoideæ, læves, pisi magnitudinis, calyce magis minusve explanato insidentes.—*Prome. V. Negundo*, *L.*, affinis, differt in primis floribus graciliter pedicellatis.

LAURINEÆ.

202. *MACHILUS FRUTICOSA*, nov. sp.

Frutex glaber, gemmis velutinis; folia ovato ad ovato-oblonga, $2\frac{1}{2}$ —4 poll. longa, basi rotundata subdecurrentia, petiolo crasso lato 2—5 lin. longo, glabra, rigide coriacea, obtusa et passim rotundata, marginibus recurvis, subtus glauca, nervis, simul cum reticulatione copiosa, prominentibus;

flores... ; paniculæ folio longiores, glabræ, longe-pedunculatæ ; pedicelli sub fructu brevissimi ($1-1\frac{1}{4}$ lin. longi) et incrassati uti in *Phæbe* ; perianthium minute adpresse pubescens, segmentis patentibus oblongis obtusis ; fructus globosi, glabri, pisi magnitudinis.—*Martaban* (Dr. Brandis).

203. *TETRANTHERA* (CYLICODAPHNE) *CALOPHYLLA*, nov. sp.

Arbuscula, novellis fulvescenti-tomentellis ; folia ovato-oblonga ad lanceolata, basi acuta v. acuminata, longius v. brevius acuminata, petiolo $\frac{1}{2}-1$ poll. longo magis minusve tomentoso suffulta, rigide membranacea, $3\frac{1}{2}-7$ poll. longa, supra lutescenti-viridia et (costa immersa excepta) glabra, subtus pallida, tomentella, penninervia, prominenter reticulata ; flores in umbellam parvam bracteatum congesti ; umbellæ pedunculo $2\frac{1}{2}-3\frac{1}{2}$ lin. longo tomentello solitario axillari suffultæ v. secus ramulum novellum axillarem fulvo-tomentosum quasi racemiformem digestæ, raro in racemum verum brevem corymbiformem pedunculo fulvescenti-puberulo suffultum efformantes ; involucri foliola concavo-rotunda, puberula ; perianthium extus pubescens ; filamenta glabra ; antheræ 4-locellatæ ; baccae oblongo-ovatæ, $\frac{1}{2}$ poll. fere longæ, læves, carnosæ, cupulâ majusculâ truncatâ extus minute pubescenti in pedicellum brevem crassum attenuatâ suffultæ.—*Martaban, Tenasserim.* Species quoad folia et inflorescentia variabilis, *Cylicod.* *Wightianæ, N. E.*, arcte affinis ejusve probabiliter varietas insignis ?

204. *TETRANTHERA* (CYLICODAPHNE) *NUCULANEA*, nov. sp.

Frutex ramulis teretibus tomentosis ; folia obovato-oblonga ad oblongo-lanceolata, petiolis 4—5 lin. longis pallide-tomentosis suffulta, basi acuta, 5—6 poll. longa, obtusiuscule apiculata, crasse chartacea, supra glabra, subtus glauca et plus minusve dense puberula, reticulatione inter nervos laterales crassiusculos tenui sed conspicua ; flores .. , apparenter umbellas subsessiles axillares formantes ; pedunculus in speciminibus fructigeris crassissimus vix 3 lin. longus ; fructus pallide straminei, oblongi, c. 6—7 lin. longi, læves, cupula integra magna carnosa suffulti.—*Tenasserim.* (Revd. Parish).

205. *TETRANTHERA* (CYLICODAPHNE) *ALBICANS*, nov. sp.

Arbuscula, novellis minute puberulis ; folia oblongo-lanceolata ad lanceolata, basi attenuata, petiolo 5—8 lin. longo gracili subglabro suffulta, breve acuminata, chartacea v. tenuiter coriacea, 6—10 poll. longa, glabra, subtus albida, reticulatione inter nervos tenues prominentes tenui sed conspicua ; umbellæ involucratæ, velutino-tomentosæ, pedunculo gracili c. 4 lin. longo canescenti-tomentoso suffulti, in racemum abbreviatum v. subsessilem velutino-tomentosum axillarem v. vulgo supra foliorum delapsorum cicatricibus orientem dispositi ; involucri phylla canescenti-velutina ; fructus .. ; cupula

magna, carnosa, undulato-lobata, in pedicellum crassum attenuata.—*Pegu.*
Ex affinitate *T. Panamoje*, *N. E.*

206. *LITSÆA LEIOPHYLLA*, nov. sp.

Arbor inflorescentiis exceptis glaberrima; folia lanceolata v. oblongo-lanceolata, 5—6½ poll. longa, basi subinaequali acuminata, petiolo gracili 1—1½ pollicari glabro suffulta, obtuse acuminata, tenuiter coriacea, glaberrima, supra lucida, subtus vix glaucescentia, supra basi triplinervia et penninervia, obsoletissime reticulata; flores fulvo-villosi, pedicellis brevibus tomentosis suffulti, racemos axillares petiolo breviores abbreviatis fulvo-villosos simplices formantes; filamenta glabra; baccæ desunt. *Tenasserim* v. *Andamans.* (Helf. 4330).

207. *DAPHNIDIUM ARGENTEUM*, nov. sp.

Arbor parva, novellis argenteo-sericeis; folia lanceolata v. lato-lanceolata, utrinque acuminata, petiolo 3—5 lin. longo argenteo-pubescente glabrescente suffulta, 3½—6½ poll. longa, crasse chartacea, supra glabra, subtus adpresse argenteo-sericea, penninervia, utrinque laxè reticulata; flores virescenti-lutei, pedicellis brevissimis tomentosis, in racemum brevem tomentosum basi bracteis concavis pubescentibus involucreto disgesti; perianthium 6-fidum, extus adpresse pubescens; antheræ 2-locellatæ; filamenta subglabra.—*Pegu, Martaban.*—Species insignis, foliorum structura et habitu *Beilschmiedia* genus in mentem revocat.

PROTEACEÆ.

208. *HELICIA PYRRHOBOTRYA*, nov. sp.

Arbor?, novellis ferrugineo-villosis; folia obovato-lanceolata, breve acuminata, versus basin obtusam attenuata, c. pedem longa, petiolis crassis 2—5 lin. longis suffulta, chartacea, grosse serrata, adulta glabra v. subtus secus costam sparse ferrugineo-pubescentia; flores 1—1½ poll. longi, geminati, pedicellis crassis 1½ lin. longis ferrugineo-villosis suffulti, racemos c. pedem longos robustos dense ferrugineo-villosos axillares efficientes; squamulæ hypogynæ ...; ovarium stylusque læves. *Martaban*, (Dr. Brandis).

PODOSTEMACEÆ.

209. *HYDROBRYUM LICHENOIDES*, nov. sp.

Plantulæ minutæ gregariæ; rhizoma latum membranaceum, lobatum, terræ v. saxis adpressum, viride, vix ½ lin. latum, 2—3 lin. longum; folia perpauca tantum pedicellorum basi sita, squamæformia; pedicelli filiformes, ½ lin. longi; capsulæ globosæ, c. ¼ lin. in diametro, lato-8-costatæ.—*Martaban.* (Revd. Parish).

URTICACEÆ.

210. ELATOSTEMA MEMBRANIFOLIUM, nov. sp.

Suffrutex erectus, ramosissimus, *E. lineolati* habitu, glaberrimus, ramulis 4-quetris, lævissimis; folia alterna, subinæqualia, cum basi inæquali sessilia, $1\frac{1}{2}$ — $2\frac{1}{2}$ poll. longa, acuminatissima (acumine obtuso et integro), tenuiter membranacea, grosse et obtusiuscule crenato-serrata, utrinque lævia et striis destituta, basi irregulari-triplinervia, nervis tenuibus sed conspicuis, per nervos laterales strictis rectangulares cum costa anastomozantibus; stipulæ minutæ, subulato-lineares; flores minuti, sessiles, capitula (nondum evoluta) parva sessilia in foliorum axillis v. iisdem opposita formantes; perianthium glabrum.—*Tenasserim*, (Dr. Brandis)—*E. lineolato*, Wight, arcte affine, absentia striolarum autem tute distinguendum.

211. ELATOSTEMA BULBIFERUM, nov. sp.

Herba monoica v. dioica, erecta, $\frac{1}{2}$ —1 pedalis, succulenta, simplex v. sub-ramosa, glabra, caulibus teretibus ad internodia bulbiferis; folia opposita, dimorpha, quorum evoluta obliqua, ovata v. ovato-lanceolata, petiolis vix lin. longis suffulta, superiora cum basi inæquali subsessilia, $2\frac{1}{2}$ — $3\frac{1}{2}$ poll. longa, grosse serrata, herbacea, breve acuminata, glabra, supra striis albis adnatis oblecta, basi triplinervia, passim nervis nonnullis adjectis; folia stipuliformia, lanceolata ad ovato-lanceolata, magis variabilia, $\frac{1}{4}$ — $\frac{1}{2}$ poll. longa, acuta v. obtusa, integra v. serraturis nonnullis, inferiora vulgo majora; stipulæ minutæ, subulatæ; flores minuti, pedicellati, cymosi; cymi feminei densiores et pedunculis gracilibus brevioribus suffulti; masculi laxi, pedunculo 1—2 pollicari suffulti e tuberibus globulosis crassis axillaribus v. in ramulorum furcationibus sitis subvillosis orti; perianthium glabrum.—*Tenasserim*, *Arracan*.

212. ELATOSTEMA GIBBOSUM, (*Procris gibbosa*, Wall., Cat. 7273).

Herba procumbens, repens, glabrescens, caulibus ascendibus c. semipedalibus florigeris; folio alterna, obovato-oblonga ad trapezoideo-oblonga, subobliqua, cum basi oblique-cordata subsessilia, obtusa v. subobtusa, 2—3 poll. longa, herbacea, grosse rotundato-crenata, supra pilis brevibus albis transverse adnatis adspersa, subtus secus nervos parce pubescentia, basi 3—5 plinervia; stipulæ conspicuæ, membranaceæ, brunneæ, usque ad 3 lin. longæ, lanceolatæ, acuminatæ, persistentes, etiam eæ foliorum abortivorum evolutæ; flores masculi majusculi, c. 1 lin. in diametro, subsessiles, in cymam parvam pedunculo $1\frac{1}{2}$ —2 poll. longo pubescente axillari suffultam collecti; perianthium glabrum.—*Martaban*, *Tenasserim*.—In vicinitate *E. cornuti* ponendum; an potius generi *Pellionie* adscribendum?

213. DORSTENIA GRIFFITHIANA, nov. sp. (D. sp. Griff. Not. Dicot. 403).

Frutex humilis, ramulis angularibus ochraceo-pubescentibus ; folia elongato-obovata ad cuneato-elliptica, petiolo crasso $\frac{1}{2}$ — $\frac{2}{3}$ pollicari pubescente glabrescente suffulta, basi angustata acuta v. rotundata, 8 poll.— $1\frac{1}{4}$ ped. longa, abrupte acuminata, tenuiter coriacea, integra, supra lævia, subtus scabra ; stipulæ setaceæ, pubescentes ; flores monoici, in receptaculis capituliformibus involucribus extus velutinis pedunculatis congregati ; pedunculi velutini solitarii, axillares ; involucrium sub 4—6 partitum ; syncarpia dimorpha, involucri bracteis reflexis velutinis.—*Tenasserim.*

214. *FICUS AFFINIS*, Wall., Cat. 4524.

Arbor mediocris, glabra ; stipulæ breves, et parvæ, ovato-lanceolatæ, glabræ ; folia elliptica ad ovato-oblonga, basi obtusa v. rotundata, obtusiuscule et subabrupte acuminata, 3—4 poll. longa, chartacea, integra v. subundulata, glabra, basi nonnunquam obscure 3-nervia, nervis lateralibus numerosis et subparallelis secus marginem anastomozantibus, utrinque crebre reticulata ; receptacula piperis grani magnitudine v. paullo majora, globosa ; flavescentia, pustulis obsoletis aurantiacis adspersa, glabra, basi 3-bracteata, pedunculo brevissimo $\frac{1}{4}$ —1 lin. suffulta, vulgo geminata in foliorum axillis v. supra foliorum delapsorum cicatricibus ; bractæ persistentes, minutæ, lato-triangulares.—*Pegu, Tenasserim, Andamans.*—Prope *F. rhododendri-foliam*, Miq., inserenda.

215. *FICUS GENICULATA*, nov. sp.

Arbor magna epiphytica, ramulis robustis cicatrisatis novellis pubescentibus ; stipulæ lato-ovatae, acutæ, glabræ v. canescentes ; folia elliptica, elliptico-ovata v. elliptico-oblonga, petiolo 3—4 pollicari apice geniculato inserta, basi obtusa v. acuta, breve et abrupte acuminata v. apiculata, integra, rigide coriacea, utrinque lucida, basi breve 3-nervia, nervis lateralibus subparallelis et magis approximatis sæpius subobsoletis, reticulatione elegante magis minusve obsoleta raro conspicua percursa ; receptacula globosa, pisi minimi v. piperis grani magnitudine, flavida, albo-pustulata, glabra, 3—4 bracteata, sessilia v. subsessilia, in foliorum axillis v. supra eorum cicatrisibus geminata ; bractæ persistentes, lato-rotundatæ, brunneæ, glabræ.—*Pegu, Martaban, Tenasserim.*—Ex affinitate *F. infectoriæ*, Willd.

216. *FICUS INSIGNIS*, nov. sp.

Arbor mediocris, ramulis crassis cicatrisatis tomentellis ; stipulæ lato-ovatae tomentosæ ; folia iis *F. geniculatae* subconsimilia, elliptica ad ovato-oblonga, petiolo 2—3 poll. longo apice geniculato suffulta, basi rotundata v. obtusa, 5—7 poll. longa, obtuse apiculata, integra v. subundulata, glabra, rigide coriacea, supra lucida, nervis lateralibus subparallelis et moderate approximatis, secus marginem arcuato anastomozantibus, subimpressis, reticulatione elegante vix prominente ; receptacula cerasi minimi magnitudine,

globosa v. subglobosa, cinerascens albida, roseo-punctata, dense tomentoso-villosa, basi bracteata, pedunculo crasso brevissimo tomentoso suffulta, in foliorum axillis v. supra eorum cicatricibus vulgo geminata; bracteae persistentes, lato-ovatae, scariosae, brunneae, glabrae.—*Prome.* Præcedenti affine.

217. *FIGUS CALONEURA*, nov. sp.

Arbor glabra; folia iis *F. Rumphii* consimilia, cordato-ovata, sensim obtusiuscule-acuminata, basi cordata, petiolo 3—4 poll. longo apice geniculato bi-glanduloso suffulta, 4—5 poll. longa, $2\frac{1}{2}$ — $3\frac{1}{2}$ poll. lata, grosse et remote repando-dentata, tenuiter coriacea, glabra, utrinque opaca, supra haud punctata, nervis lateralibus unacum nervis basilaribus omnibus divergentibus et subarcuatis pallidis crassis secus marginem anastomozantibus, nervatione transversali elegante sed tenuiuscula; receptacula desunt.—Burma, sine loco natali, (Dr. Brandis).—Ex affinitate *F. Rumphii*, Bl.

218. *FIGUS POMIFERA*, nov. sp.

Frutex scandens, glaber; folia obovata v. sub-rhomboido-obovata, petiolis 3—4 lin. longis scabridis, basi subcuneata, $1-2\frac{1}{2}$ poll. longa, obtusa v. subemarginata, glabra, coriacea, marginibus subrecurvis, nervis utrinque 4—5 lateralibus paullo prominentibus, in areolis reticulationis obsoletae lacunosopunctata; receptacula pomiformia v. oblongo-elliptica, c. $1-1\frac{1}{4}$ poll. crassa, subumbonata, in stipitem brevissimum (c. $\frac{1}{2}$ lin.) crassum constricta, lævia, miniato-aurantiaca, pedunculo crasso 1—2 lin. longo puberulo suffulta, vulgo solitaria e foliorum axillis v. supra eorum cicatricibus; bracteae ad pedunculi apicem 3, persistentes, triangulari-ovatae, subglabrae. Variat. *a.* pomiformis, receptacula pomiformia,—*Tenasserim*, (Falconer); *β.* oviformis, receptacula elliptico-oblonga ad ovoidea,—*Sumatra*.

219. *FIGUS PYRRHOCARPA*, nov. sp. (*F. tuberculata*, Wall., Cat. 4539, non Roxb. et aliorum).

Frutex humilis, 1—3 pedalis, ramulis adpresse brunneo-setosis; stipulae lineari-lanceolatae, acuminatae, glabriusculae v. dorso pubescentes; folia obverse lanceolata ad subcuneato-lanceolata, basi cuneata v. acuta, petiolo lineas perpaucas usque ad $1\frac{1}{2}$ poll. longo adpresse pubescente glabrescente suffulta, breve et obtusiuscule acuminata, integra, crasse membranacea, supra glabra v. pilis minutis inconspicuis adpersa, subtus secus nervos sparse adpresse hirsuta et glabrescentia, nervis arcuatis, reticulatione laxa; receptacula depresso-pyriformia, cerasi magnitudinis, purpurascens-viridia, costata, squamis nonnullis varie dispositis adpersa, praesertim dum juvenilia pilis rigidis adpressis v. subpatentibus brunneis v. rufis oblecta, pedunculis $\frac{1}{4}$ — $1\frac{1}{4}$ pollicaribus pubescentibus crassis suffulta, solitaria e trunco subterraneo orta v.

secus surculos aphyllis subterraneos errumpentia ; bractæ ad apicem pedunculi 3, ovatæ, breves.—*Pegu, Martaban.*—Ex affinitate *F. ischnopodæ*, etc.

219. *FICUS ANASTOMOZANS*, Wall., Cat. 4513.

Frutex repens, humilis, magis minusve scabro-pubescentia ; stipulæ minutæ, scabræ ; folia oblongo-lanceolata ad lanceolata, basi acuta v. obtusa, petiolo 2—6 lin. longo scabro-pubescente suffulta, magis minusve obtusiuscule-acuminata, 2—4 poll. longa, grosse et irregulariter sinuato-dentata, dentibus rotundatis v. obtusis, membranacea, supra scabro-pubescentia, nonnunquam subglabrescentia, nervis numerosis rectangulari-divergentibus et anastomozantibus ; receptacula ovoidea, piperis grani magnitudinis, umbonata, basi non v. vix constricta, scabro-puberula, pedunculo vix $\frac{1}{2}$ lin. longo et pubescente suffulta, solitaria e foliorum axillis v. supra eorum cicatricibus errumpentia ; bractæ minutæ.—*Tenasserim.*

220. *FICUS LEPIDOSA*, Wall., Cat. 4511.

Arbor mediocris, novellis parce pubescentibus ; stipulæ lineari-lanceolatae, acuminatissimæ, glabræ v. subglabræ ; folia obovata ad elliptica, petiolis 1—2 poll. longis parce pubescentibus glabrescentibus suffulta, basi obtusa, breve acuminata, 5—6 poll. longa, crasse membranacea, supra glabra v. pilis nonnullis brevibus adspersa, subtus parce et breve pubescentia, subpenninervia ; receptacula turbinato-globosa, umbonata, pubescentia, aurantiaco-miniata, cerasi magnitudine, pedunculo 3—5 lin. longo crasso pubescente sustentata, vulgo geminatim e foliorum axillis v. supra eorum cicatricibus erumpentia ; bractæ ad apicem pedunculi, ovatae, acutæ, glabræ, c. lin. longæ.—*Pegu.*—*F. chrysocarpæ*, Rwdt., affinis, errore quoddam cl. Miquel in Annalis suis me hanc speciem cum *F. diversifolia* identicam declarasse putavit.

AMENTACEÆ.

221. *QUERCUS EUMORPHA*, nov. sp.

Arbor 20—30 pedalis, glaberrima ; folia ovato-oblonga v. oblonga, nonnunquam inæqualia, basi in petiolum gracilem 5—8 lin. longum glabrum attenuata, breve et obtusiuscule acuminata, 3—4 poll. longa, coriacea, apicem versus leviter obtusiuscule serrata, glabra, concoloria, nervis tenuibus et reticulatione densa subobsoletis ; pedunculus fructiger usque ad 2 poll. longus, apparenter glaber, 1 v. 2 fructus gerens ; glans ovoidea, 9—10 lin. fere longa, lævis, exserta ; cupula 7—8 lin. in diametro, concava, crasse coriacea, brunnea, glabra, subverniosa, junior squamis triangularibus acutis adpressis subdistinctis dein in zonas concentricas angustas inæquales et irregulares confluentibus oblecta v. rugato-rugosa.—*Martaban.*

222. *QUERCUS BRANDISIANA*, nov. sp.

Arbor parva v. mediocris, ramulis canescenti, v. ochraceo-pubescentibus; folia oblonga ad obovato-oblonga, basi sæpius inæquali acuta v. obtusa, 4—5 poll. longa, petiolo 5—8 lin. longo gracili glabro suffulta, breve et obtusiuscule acuminata, obtusiuscule repando-serrata, utrinque subopaca, tenuiter coriacea, supra rugata et glabra, subtus glauca et fugaci-puberula, nervis supra impressis strictis subtus prominentibus sed tenuibus, cum nervatione transversa conspicuis; pedunculus fructiger c. 1, raro usque $2\frac{1}{2}$ poll., longus, fructus paucos tantum gerens, ochrascenti-tomentosus; glandes juniores depressæ adpresse puberulæ, magis minusve inclusæ, dein exsertæ, ovoidæ, glabræ; cupula canescenti-velutina, concava, c. $\frac{1}{2}$ poll. in diametro, e zonis circ. 5—6 concentricis lamellatis erosio formata.—*Martaban.*—In sect. *Cyclobalani* inserenda.

*CHLORANTHACEÆ.*223. *CHLORANTHUS INSIGNIS*, nov. sp.

Suffrutex $1\frac{1}{2}$ —2 pedalis, glaber, in sicco sublutescens; folia petiolis 1—2 lin. longis suffulta, linearia, basi acuminata v. acuta, sensim et longissime acuminata, $3\frac{1}{2}$ — $4\frac{1}{2}$ poll. longa, subcoriacea, integra, glabra, nervis lateribus tenuissimis, vix reticulata; spicæ axillares, fructiferæ 1—2 poll. longæ, simplices, glabræ; bractæ minutæ, crassæ; fructus casi.—*Martaban.*

*SCITAMINEÆ.**HEMIORCHIS* nov. sp.

Flores præcoces, spicati, sessiles. Calyx tubulosus, sursum ampliat, 3-fidus. Perianthii tubus calyce brevior filiformis; phylla 3 exteriora æqualia, interiora subæquilongia, basi utrinque corniculata apice 2—3 denticulata; labellum lato-oblongum, concavum, apiculatum. Filamentum phyllis fere duplo brevius, apice incurvum, connectivam supra anthera utrinque mutica vix productum. Ovarium 1-loculare, placentis 3 parietalibus; stylus filiformis; stigma paullum incrassatum, oblique truncatum. Capsula 1-locularis, subplicato-10-sulcata, 3-valvis; semina conica, basi albo-arillata.—Herbæ perennes *Gastrochilo* habitu et characteribus essentialibus affines; scapis radicales pallidi squamati iis *Geodori* haud absimiles.

224. *H. BURMANICA*, nov. sp. Tab. VIII.

Rhizoma album, crassum, repens, hypogæum, nudum; folia post anthesin erumpentia iis *Gastrochili* simillima, lato-oblonga, brevissime acuminata, basi inæquali-rotundata in petiolum brevem decurrentia, glabra; vaginæ striatæ, glabræ; scapi radicales, solitarii, dense tomentelli, a basi usque ad medium bracteis amplis pallidis remotis v. confertis 1— $1\frac{1}{2}$ poll. longis oblongis et subacutis vestiti; flores spicati, sessiles, mediocres; calyx puberulus, albus,

3-fidus, lobis æqualibus acutis; perianthii phylla exteriora 3 fere semipollinaria, virescenti-albida, oblongo-linearia, apiculata v. 2—3 lobulata, marginibus magis minusve recurva, superiori latiore; interiora 2 obovato-oblonga, pallide rubella, apice obsolete 2—3 denticulata; labellum concavum lato oblongum, aurantiacum, basin versus pallidius, intus secum carinam sanguineum carinatum, carina in apiculum 3-angularem acutum excurrente; antheræ cerino-luteæ, filamenta c. 1 lin. longa, incurva; capsulæ ovales, puberulæ, calyce emarcescente coronatæ, c. $\frac{1}{2}$ poll. longæ; semina basi arillo albo suffulta.—*Pegu, Martaban, Tenasserim.*

MELANTHACEÆ.

STEMONA GRIFFITHIANA, nov. sp. Tab. X.

(Gen. nov., Griff. Journ. of Travels p. 149).

Herba erecta, perennis, glabra, rhizomate crasso hypogæo; folia hysteranthia, ovata, c. 3—5 poll. longa, breve acuminata, petiolo 3—5 poll. longo suffulta, chartacea, glabra, parallelinervia, eleganter transverse venosa, sericanter-nitentia; flores virescenti v. sordide purpurei, pedicellis strictiusculis poll. circiter longis suffulti, in turionibus erectis aphyllis scapiformibus dein foliatis 3—6 poll. longis corymboso-racemosi; bractæ lineari-lanceolatæ acuminatæ, c. 3—4 lin. longæ; perigonium 4-phyllum, phylla poll. longa, v. paulo longiora, lineari-lanceolata, acuta; stamina 4, filamenta lata, purpurea; antheræ aureæ, cuspidatæ; ovarium 1-loculare, ovulis 6, lineari-oblongis ex apice pendulis capsulæ compresso-ovatae, semipollicares, bivalves, 3—4 spermæ; semina sulcato-carinata, lineari-oblonga, subapiculata, basi arillo brevi albo aucta.—*Ava, Martaban, Pegu.*

AROIDEÆ.

HAPALINE, Schott.

Spatha lanceolata sursum plana, basi tantum complanata et spadiceis parti femineæ adnata. Spadix interrupte androgynus, genitalibus rudimentariis nullis. Stamina lineari-lanceolata, peltata, membranacea, areolato-reticulata, subtus marginem versus antheras 4—6 minutas globosas gerentia, spadicem linearem a parte feminea paulo discretum obtegentia. Ovaria singula serie superposita, unilocularia, ovulo solitario erecto; stigma subsessile, subcapitatum.—Herbæ humiles, radice tuberosa, uni- v. pauci-foliatæ, spathas niveis.

1. H. BENTHAMIANA, Schott. Tab. IX.

Herba c. semipedalis, radice tuberosa, basi albo-vaginata; folia 3—4 poll. longa, petiolo æquilongo suffulta, oblonga, basi profunde sinuato-cordata, lobis basilaribus complicatis et obtusiuscule prolongatis, glabra, breve acuminata, nervis anastomozantibus; flores 1—3-ni e rhizomate pro-

trusi, scapo 5—6 poll. longo gracili suffulti ; spatha nivea, lineari-lanceolata ad lanceolata, c. $1\frac{1}{2}$ poll. longa, reflexa, reticulata ; spadix spathæ fere longitudinis, ejus pars mascula exserta strictiuscula lineari-subulata, alba.—*Martaban.*

TABULARUM EXPLANATIO.

Tab. VIII.—*Hemiorchis Burmanica*.—Fig. A, planta florens, magn. nat. ; fig. B, folium cum cauli vaginato, magn. nat. ; fig. 1, perigonii phyllum exterioris ; fig. 2, phyllum exterius superius ; fig. 3, perigonii phyllum interius laterale ; fig. 4, labellum cum carina, a latere visum ; fig. 5, anthera a latere visa ; fig. 6, eadem a fronte ; fig. 7, capsula, magn. nat. ; fig. 8, semen, arillo remoto.

Tab. IX.—*Hapaline Benthamiana*.—Fig. A, planta, magn. nat. ; fig. 1, spadix ; fig. 2, ovarium ; fig. 3, sectio verticalis fructus, semen immaturum exhibens ; fig. 4, squama staminalis antheras gerens, a latere interiore visa.

Tab. X.—*Stemona Griffithiana*.—Fig. A, planta florens ; fig. B, caulis foliati pars superior ; fig. C, racemus fructiger ; fig. 1, perigonii phylla 2 cum stamine ; fig. 2, semen cum arillo, latere visum ; fig. 3, capsula aperta, semina exhibens ; figuræ omnes magn. nat.

Errores graviores in parte priori (J. A. S. B., vol. XLI, pt. II), corrigendi.

Page 311. lin. 6. infra pro *apicibus* lege *apices*.

Pag. 312. lin. 10. supra pro *pomini majoris magnitudine* lege *pomi minoris magnitudine, brunneo-velutinæ*.



NOTES ON SOME SPECIES OF MALAYAN AMPHIBIA, AND REPTILIA,—
by DR. F. STOLICZKA.

(Received 15th Feb. 1872; read 5th March, 1872.)

[With plate XI.]

It is nearly three years ago that I had the pleasure of submitting to the Society a few notes on Indo-Malayan Reptiles and Amphibians, chiefly collected by myself along the Burmese and Tenasserim coasts, about Penang and on the Nicobar and Andaman islands. When visiting Penang in 1869, I received information of a tolerably extensive* collection of Reptiles, brought together by a zealous Jesuit during a residence of about twenty years on the island. The specimens were collected either on Penang itself or on the opposite coast of the Wellesley Province. A very large number had been captured alive, and coloured drawings, taken from most of the live specimens, had been prepared. The colouring appeared to me to have been faithfully copied, and this it was which particularly excited my interest in the collection, because in many cases the colours of Reptiles fade most rapidly, as soon as the specimens are placed in spirit; in others the colouring changes immediately after death, and again some alter even during life their colour, as soon as they become conscious of their captivity. In any case the coloured sketches from life seemed to me valuable and I, therefore, resolved to buy the collection.

As soon as the formal matters were arranged, the collection of the specimens was transmitted to me, the drawings, however, were afterwards not considered to form an essential part of it, and were handed over to some one else, according to a wish of the deceased gentleman under whose supervision they were executed. After a brief correspondence it did not appear to me much use treating further about the subject. My interest in the collection has, on that account naturally enough, partly diminished, and having had other more pressing work to attend to, the specimens were for more than two years left unnoticed. More recently my friend Mr. Stahlknecht of Singapore visited Sumatra, and made for me a very nice little collection of Reptiles, most of which were in a beautiful state of preservation. This circumstance induced me to look over my old acquaintances, and to prepare a critical list of all of them. In the old collection I only found two new species, a *Rana* and a *Simotes*, a specimen of the latter had very recently been also obtained by Mr. J. Wood-Mason's collector at Jahore, situated at the extreme south end of the Malayan Peninsula, north of Singapore island. Mr. Stahlknecht's collection yielded a new *Calamaria*.

* This refers to the number of specimens, but not to that of species, as I subsequently discovered.

Thus, although I cannot say, that I came into possession of a great number of new forms, there are among those, which I shall place on record, a few rare and very interesting species, some of which were previously known only from single specimens, and these often were not very perfect. I may mention for instance *Draco quinquefasciatus*, *Podophis chalcides*, *Ophites subcinctus* and *albofuscus*, *Ablabes flaviceps*, *Oxycalamus longiceps*, &c.

I shall first enumerate all the species, and attach an (*) asterisk to those, about which I shall have to say a few words.

The collection was made, as I said, to a large extent on Penang itself or in the Wellesley Province, and judging from the examination of it, I have found no reason to doubt in any way this statement. A great many of the same species had been collected by myself in that part of the country on a former occasion, others were known to occur there from the very elaborate and extensive researches of Dr. Cantor; others again had been recorded from Malacca, Singapore, Sumatra or Java, all countries which belong to the same zoological province, and which have a large number of species common. I have not met with a single instance which would lead me to suspect, that any mixture of other distant localities had taken place. Thus the present list in connection with that of Drs. Cantor, Gray and Günther, and my own published in 1870, may be considered as fairly completing the number of Reptiles and Amphibians, inhabiting Penang and the neighbouring Wellesley Province. Mr. Stahlknecht's specimens are from the neighbourhood of Dilli on Sumatra. In the general list I shall briefly note the localities as *Penang* and *Sumatra*.

BATRACHIA.†

1. *Rana tigrina*, var. *pantherina*, Fitz. apud Steindachner. (Novara Amphibiens).—*Penang*.
- 2.* „ *fusca*, Blyth.—*Penang*.
3. „ *lymnocaris*, Boie (= *gracilis*, Wiegman.); typical.—*Penang*.
- 4.* „ *lymnocaris*, var. *pulla*, Stol.—*Penang*.
- 5.* „ *plicatella*, n. sp.—*Penang*.
6. *Polypedates maculatus*.—*Penang*.
7. „ *quadrilineatus*.—*Penang* and *Sumatra*.
8. *Hylarana erythraea*.—*Penang* and *Sumatra*.
Comp. Proceed. A. S. B. for June, 1872, p. 104. The largest specimen measures: body 3 inch, hind limb 5 inch.
9. *Bufo melanostictus*.—*Penang*.

† If no special reference to literature is given, it is understood that the species is described in Dr. Günther's Reptiles of Brit. India, or in my former paper on Malayan Reptiles in Journal A. S. B. vol. xxxix, pt. II.

10. *Bufo asper*.—*Penang*.
Largest specimen, body 5·5 inch. long.
11. *Epicrura glutinosum*.—*Penang*.

SAURIA.

12. *Euprepes carinatus*, Schneid., = *rufescens*.—*Penang* and *Sumatra*.
All have a rufescent bronzy tinge and dorso-lateral pale bands.
- 13.* *E. olivaceus*.—*Penang* and *Sumatra*.
14. *Riopa albopunctata*.—*Penang*.
Exactly the same as in Bengal.
15. *Podophis chalcides*.—*Sumatra*.
- 16.* *Gymnodactylus* (? *Cyrtodactylus*) *pulchellus*.—*Penang*.
17. *Cyrtodactylus affinis*.—*Penang*.
Comp. J. A. S. B. vol. xxxix, pt. II, 1870, p. 167.
18. *Peripia mutilata*, Wieg., = *Peronii*, D. and B., teste Peters et
Günther.—*Penang* and *Sumatra*.
19. *Hemidactylus frenatus*.—*Sumatra*.
20. *Nycteridium platyurus*, Schneid. = *Schneideri*.—*Penang* and
Sumatra, very common.
All have less dark coloration than Himalayan or Khasi hill specimens,
but are in other respects not distinguishable, Comp. J. A. S. B. xl,
pt. II, p. 103.
21. *Gecko guttatus*.—*Penang*.
22. „ *stentor*.—*Penang*.
23. *Ptychozoon homalocephalum*.—*Penang* and *Sumatra*.
24. *Bronchocela cristatella*, Kuhl.—*Sumatra*, very common.
All have 36 to 42 small equal scales in a lateral row.
25. *Draco volans*, Linn.—*Penang* and *Sumatra*, very common.
- 26.* „ *quinquefasciatus*.—*Penang*.
- 27.* „ *fimbriatus*.—*Penang*.
28. *Hydrosaurus salvator*.—*Penang* and *Sumatra*.

The light spots and bands are in young and in old males [at least] bright yellow, not white. The species is also very common on all the Nicobar and Andaman islands.

29. *Crocodylus porosus*.†—*Penang*.

† The similarity of form and colour of the young of this species with equally large specimens of *C. Pondichianus*, Günther, is very striking. My collector recently brought several young specimens (12-14 inches) of the latter species from Arrakan, and when compared with equally large specimens of *porosus*, the former all have the snout, and also the tail, conspicuously shorter; all have only six rows of shields on the back, but there is an additional one on either external edge broken up into single shields. In *porosus* the outer row of shields on either side is complete, or continuous, and on the whole the dorsal shields appear to be smaller. In every other respect the young of both species are identical. I have not seen an adult of *Pondichianus*, but it ought to be looked for in Arrakan. Both have a small shield on either anterior side of the

OPHIDIA.

30. *Typhlops nigroalbus*.—Penang.
31. " *braminus*.—Penang.
32. *Cylindrophis rufus*.—Penang.
- 33.* *Calamaria Stahlknechti*, n. sp.—Sumatra.
- 34.* *Oxycalamus longiceps*.—Penang.
- 35.* *Simotes bicaenatus*.—Sumatra and Penang.
- 36.* " *cruentatus*, Theob.—Penang.
- 37.* " *catenifer*, n. sp.—Penang and Jahore.
- 38.* *Cyclophis tricolor*.—Sumatra.
- 39.* *Ablabes flaviceps*, Günth.—Sumatra.
40. *Composoma (Elaphis) melanurum*.—Penang.
41. " *radiatum*.—Penang.
42. *Ptyas korros*.—Penang.
43. " *hexagonotus*, (Cant.).—Penang.
44. *Tropidonotus quincunctiatus*.—Penang.
45. " *trianguligerus*, Schleg.—Penang.
46. " *vittatus*.—Penang. (Günther's Colub. Snakes).
- 47.* *Gonyosoma oxycephalum*.—Penang.
- 48.* *Dendrophis caudolineatus*, Gray.—Penang and Sumatra.
49. " *pictus*.—Penang and Sumatra.
50. *Tragops prasinus*.—Penang and Sumatra.
51. *Dipsas cynodon*.—Penang.
52. " *Drapiezii*.—Sumatra. (Comp. Schlegel's Abbildungen).
53. " *dendrophila*.—Penang.
54. *Chrysopelea ornata*.—Penang and Sumatra.
55. " *rubescens*.—Penang and Sumatra.

neck, it being a rudiment, or rather probably the beginning, of the anterior nuchal plates.

Besides *C. Pondichianus*, my collector brought among others the following species which I do not think had been previously recorded from Arrakan.

Callula pulchra.

Diplopetma carnaticum and *D. Berndmorei*.

Polypedates maculatus and *P. quadrilineatus*.

Hylarana erythraea and *H. Tyleri*. Both quite distinct species.

Riopa lineolata.

Tachydromus seolineatus.

Hemidactylus (Doryura) Berndmorei.

Hinulia maculata. Also common on all the Andaman and Nicobar islands.

Lycodon aulicus, (black variety).

56. *Psammodynastes pulverulentus*.—Penang.
 57. " *pictus*.—Sumatra.
 (Colub. Snakes, p. 251). Exactly agreeing with Günther's description.
 58. *Lycodon aulicus*.—Penang.
 59.* *Ophites subcinctus*.—Sumatra.
 60.* " *albofuscus*.—Sumatra.
 61. *Bungarus fasciatus*.—Penang.
 62. *Adenophis** (*Callophis*) *intestinalis*.—Penang.
 " " *bivirgatus*.—Penang and Sumatra.
 63. *Xenopeltis unicolor*.—Sumatra.
 64. *Python reticulatus*.—Penang.
 65. *Hypsirhina enhydria*.—Penang.

All specimens have an almost continuous dark line along the middle of the lower side.

66. *Hypsirhina plumbea*. (Very variable).—Penang.
 67.* " [*Ferania*] *alternans*.—Sumatra.
 68. *Fordonia unicolor*.—Sumatra.
 (The young are brownish olive with numerous dark dots).
 69. *Cerberus rhynchops*.—Penang.
 70. *Homalopsis bucata*.—Penang.
 71. *Hipistes hydrinus*.—Penang.
 72. *Hydrophis robustus*.—Sumatra.
 73.* *Trimeresurus Wagleri*.—Penang and Sumatra.
 74. " *erythrurus*.—Penang.

RANA FUSCA.

Comp. Anderson in P. Z. S. for 1871, p. 197.

Rufous brown above, with a pale longitudinal dorsal streak, broad in front, narrow towards the posterior end; limbs above somewhat indistinctly variegated and banded with darker brown, posterior side of femora with closer and darker variegations. Lower side uniform whitish, except a few dark spots on the lower lip, but the front-end of the lower lip has a conspicuous white spot, as stated by Blyth.

The nostrils are much nearer the snout than the eye; the tympanum is smaller than the eye, but quite distinct in a nearly full grown specimen; skin above and at the sides of the belly with few scattered slightly enlarged tubercles; lower side perfectly smooth. The first and second fingers are slightly shorter than the third and fourth respectively; the second is shortest. The metatarsus has a single, inner, marginal, elongated tubercle. The first and fifth toes are fringed externally, but the tarsus has no fold. The toes are entirely webbed and their tips very distinctly swollen.

The length of the body equals the distance from the vent to half the length of the tarsus.

* See Peters in Monatsb. Berlin Akad., 1871, p. 579.

RANA LYMNOCHARIS, var. *PULLA*.

Comp. Stoliczka, Journ. A. S. B. vol. xxxix. pt. II, 1870, p. 144.

Since the publication of my notes on this variety I have received two other specimens from Penang. The form of the body, the teeth, the structure and general coloration exactly agree with typical *lymnocharis*, except that in one of the specimens the four dark bands on the upper side of the femora are well marked and somewhat narrower than in the other, in which the coloration is typical. In both, the lower lip is spotted and the chin variegated with dusky. Neither of the specimens has a dorsal pale streak.

One of them measures, body 1.35 inch., which is only one tenth less than the distance between the vent and the metatarsal tubercle, the total of the hind-limb being 2 inch., while in a specimen of typical (half-webbed) *lymnocharis* of which the body is also only 1.35 inch., the distance between vent and metatarsal tubercle is 1.15 inch, but the total hind-limb is 2.2 inch. Thus in *lymnocharis* var. *pulla* the metatarsal bones are longer and the fourth toe on the contrary much shorter than in typical *lymnocharis*. In the former also, as previously noticed, the toes are nearly fully webbed, the web reaching to very near the tip of the third and fifth toes, but only to the base of the penultimate joint of the fourth toe.

The other specimen has the length of the body 1.3 inches, which is equal to the distance between the vent and the heel, and the total hind-limb is 2.17; thus very nearly equal to that of *lymnocharis*, only differing from it by the fuller webbing, the web reaching fully to the middle of the penultimate joint of the fourth toe. In this specimen also the tips of the toes are all remarkably swollen. All other characters are exactly as in typical *lymnocharis*.

These variations appear to me to indicate that they are progressive or undergoing certain changes according to the requirements of the animal, and that we are, therefore, not entitled to give them a specific value, unless they become permanent. I look upon this longer-limbed, shorter-toed and fuller-webbed hill form of *lymnocharis* as a small (*pulla*) local variety, possessing certain peculiarities, in exactly the same manner as the Andaman and Nicobar variety of the same species. (Comp. l. c. p. 142 et seq., and Proc. A. S. B. for June 1872, p. 102).

RANA PLICATELLA, n. sp. Pl. XI. Fig. 1.

Body moderately stout with longish hind-limbs and swollen tips to the toes.

Head large, snout obtuse, with the canthi rostrales rounded; nostrils lateral, oval, somewhat directed upwards, nearer to the tip of the snout than to the eye; eye large, prominent, its longer diameter is slightly more than

the distance between it and the nostril, but it is equal to the width of the upper side between the eyes. Tympanum naked, as large as the eye.

Head smooth above, hinder half of the eyelids tuberculated; body above with about eight longitudinal somewhat interrupted folds, with numerous small tubercles between them; limbs also smooth above, with the exception of the posterior halves of the tibiae, which are tubercular; chin in front with a few scattered, minute tubercles, a few others exist on the side of the belly, and the hinder part of the sacral region is densely studded with small plicated tubercles; the remainder of the under side is smooth.

The length of the body is very nearly equal to the distance between the vent and the middle of the tarsus; the fore limb is equal to the distance from the tympanum to the groin. The first finger is scarcely shorter than the third, the second and fourth are subequal. There is a slight fold on the inner lower edge of the tarsus, and one along the outer edge of the fifth toe. The tarsus has a single, inner, elongated, marginal tubercle. The toes are about three-quarter webbed, the web reaching on the fourth toe to scarcely beyond the base of the third-ultimate joint; on all the other toes it extends to the last joint, but it is deeply emarginate between all of them. The tips of all the toes are much swollen; the length of the fourth measured from the base of the tarsus is slightly less than half the length of the body.

Lower jaw with two fang-like projections directed inward. Tongue elongate, much broader towards the tip than at the base, terminating with two moderately sized projections. Vomerine teeth in two short oblique converging series. Sacral diapophyses not dilated.

Above, greenish brown, with a dark band from the nostril through the eye, continuing behind it; limbs with numerous transverse dark bands; they are somewhat ill-defined on the upper arm, on the lower arm there are three or four very short ones, six on the femur, five somewhat more distant ones on each tibia, three on the tarsus, one on metatarsus and a few more on the outer-side of the toes. The hinder sides of the femora are densely and rather minutely variegated with dark brown; a horse-shoe shaped yellow mark, open below, round the anus; folds on the tarsus and outer toe also yellowish; lips indistinctly variegated with pale and dusky; lower side uniform white, except on the tibiae, and on the feet, which are speckled with dark.

The only species which in some respects resembles the present form is *Rana porosissima*, Steindachner, from Angola (Novara Amphibiens, p. 18, pl. I, figs. 9-13), but it differs in the coloration of the limbs, in the smaller size of the tympanum, smaller vomerine ridges of teeth, in having the apophyses on the lower jaw scarcely enlarged, the tips of the toes not swollen &c.

EUPREPES OLIVACEUS.

The young (body 1 to 1.5 and tail 1.5 to 2 inches) are very differently coloured from the old. The snout and headshields are olivaceous, the posterior edges of all the shields being blackish; the whole body and limbs are blackish brown, with numerous rather close, transverse, greenish white or yellow stripes; tail and the entire lower side yellowish white, or quite yellow. In the adolescent and some old ones the pale transverse bands exist as remnants in the shape of transverse series of spots, but most adults become entirely olivaceous, with only the edges of the eyelids bright yellow.

GYMNODACTYLUS PULCHELLUS.

In the descriptions of this species it is usually stated that there are six dark, white edged bands across the body, but properly speaking the sixth band is situated on the base of the tail. Further, it is stated that a fold of the skin exists along the side of the body. This is in reality not the case, at least not in live specimens, but the shield-like scales of the lower side are separated from the granular upper surface by a row of conspicuously enlarged granular scales; this row becomes strongly prominent in spirit specimens, and gives the appearance of a fold.

As regards the position of the femoral pores the species is intermediate between *Cyrtodactylus* and *Gymnodactylus*, the pores lying first in a longitudinal fold and then extending flatly on the femora. This instance shews that *Cyrtodactylus*, (as likewise the present species), should be looked upon merely as a section of *Gymnodactylus*.

DRACO QUINQUEFASCIATUS.

A single male specimen measures: head and body 3.5 inch, tail imperfect, apparently about 5 inches. The hind limb is contained 1.33 times in the distance between it and the fore limb, the latter being somewhat shorter than the former. There are no enlarged tubercles on the head, but only a number of interspersed, slightly larger white scales at the sides of the neck, and a broad band of closer set ones across the occiput. The scales on the anterior part of the back are obsoletely keeled, on the posterior part they are perfectly smooth. On the wings scales are present along all the ribs, and in numerous longitudinal series on the basal half of the alar skin, while further on their number greatly diminishes, except again at the outer margin.

The specimen has only a very slight indication of a crest on the neck; the gular sack is very long and lanceolate, a dark band running at its posterior base across the lower neck. Chin dark spotted, like the body; tail also spotted at its base, but further on with brown bands. In all other respects the specimen agrees with Gray's characteristic description.

DRACO FIMBRIATUS.

Dumeril and Bibron, vol. iv, p. 448.—Gray, *Lizards*, p. 234.

A specimen from Penang exactly agrees with the one figured by Gray and Hardwicke in *Illustr. of Indian Zoology* as *D. abbreviatus* from Singapore. The scales of the back are very small and almost quite smooth, with a series of larger ones on either side at the base of each wing. Günther (*Rept. Brit. India*, p. 123) says that no orbital or rather post-orbital, spine exists. This is a mistake, at least as far as male specimens are concerned. In these there are two very distinct post-orbital spines; they are well shewn in Gray and Hardwicke's figure. Dumeril and Bibron's minute description of the headshields from Javanese specimens also appears exactly to correspond with the structure of Singapore and Penang specimens.

General colour bronze brown; head, not including the nape, a zigzag undulating slightly variegated band across the neck, another across the shoulders, a third between the hind limbs, and a fourth, though less distinct one, across the middle of the body, pale bluish, a bluish black spot between the eyes; on the body are four irregular marks, each composed of a few blackish lines, and each enclosing along the middle of the back a somewhat elongated diamond-shaped figure.

Limbs with cross dark stripes, and bluish edges to all the front and hind sides. Wings above blackish with radiating bluish lines, below pale with a few scattered black spots. Tail banded with bronze and pale bluish. Chin variegated with dark; gular pouch tinged with blue and red, dusky at the base. Body below uniform yellowish white, with scattered bluish dusky spots, mostly conspicuous along the sides.

CALAMARIA STAHLKNECHTI, n. sp. Pl. XI. Fig. 2.

Body long, cylindrical, snout somewhat narrowly obtuse; total length 13.5 inches, of which the tail is 1.2 inch; rostral reaching to the upper surface of the head; frontals anteriorly narrower than posteriorly, laterally bent down, and in contact with first and second labials, the nasal being very small; occipital six-sided, with the anterior angle shorter and more obtuse than the posterior one, it is smaller than one occipital; each of the latter has an obtuse angle in front and behind, and both form an inwardly directed angle, along the suture on either end; one præ- and one post-ocular; five upper labials, the third and fourth touch the orbit, the fifth is largest, in contact with the post-ocular and occipital; it is followed by a moderately sized shield which has quite the appearance of a sixth labial, and indeed the gape partially extends below this quasi-sixth labial; above this last extends a long-temporal. Mental shield small; five lower labials; the first pair is the smallest, separated from each other, the fifth the largest. The first pair of chin-shields is largest, each being in contact with three labials and having a very

obtuse angle behind; the shields of the second pair are only about half the size of the first, entirely separated from each other by two scale-like shields following each other, and by two other somewhat larger shields from the first very large ventral. Scales smooth, in thirteen rows; ventrals 163, anal entire, subcaudals 22, the last single occupying the shortly pointed end of the tail.

Uniform iridescent brownish black above, the two outer series of scales on either side mostly white; upper labials spotted with yellow, the fifth labial being almost entirely yellow. Lower side, beginning a short distance from the throat, with two or sometimes three ventral shields alternately yellowish white and black, the black colour encroaching laterally upwards upon the yellowish white lateral bands, and being longitudinally connected along the edges of the ventrals and subcaudals; the latter have besides an interrupted blackish line along the middle, and the pale colour is tinged with vermilion. Possibly the red colour extended over the whole of the light coloration during the life of the snake.

The only specimen examined was sent to me with several other species by my friend Mr. Stahlknecht of Singapore; he collected the same near Dilli on Sumatra.

In general aspect the species resembles *C. Linnæi*, but differs essentially in several points of its structure. It also does not agree with any of the species more recently described by Bleeker and Edeling, or figured by Ján.

OXYCALAMUS LONGICEPS.

A single specimen of this rare snake was in the Penang collection; it measures seven inches of which the tail is one.

The following may be added to Cantor's and Günther's descriptions:

The rostral shield is of moderate size, reaching with its angle to the upper surface of the head; anterior frontals small, each about one-third the size of a posterior; the suture separating the two anterior frontals is only two-fifths of the length of the suture between the posterior frontals; vertical six sided, the sides touching the supraciliaries being parallel to each other; one supraciliary not quite as wide as half the width of the vertical; occipitals nearly double the length of the vertical, reaching down on either side to the postocular; nasal in a *single* shield.

Vent. 137, anal entire, subcaudals 29.

Uniform iridescent black above and below, many of the ventrals and subcaudals with paler posterior edges; a pale yellowish spot on the fifth upper labial and a second one on each side of the throat.

SIMOTES BICATENATUS.

In several specimens, the dark dorsal band is divided by a pale reddish

line. A young specimen has only one præocular, and only the upper smaller temporal is in contact with the postoculars.

SIMOTES CRUENTATUS.

Comp. Proceed A. S. B. for August, 1872, p. 145.

This species agrees in general aspect and coloration with *S. bicatenatus*, but it has only seventeen rows of scales. One specimen in the collection has a small portion of a labial detached, forming a second (lower) præocular; it has very few dark blotches on the anterior ventrals; only two black spots on the tail, one at the root, the other near the tip.

SIMOTES CATENIFER, n. sp. Pl. XI. Fig. 3.

The body is short, stout, moderately compressed, the head large, conspicuously truncate in front.

Rostral shield well reaching to the upper surface of the head; anterior frontals considerably smaller than the posterior ones, both bent down at the sides; superciliaries narrower anteriorly than posteriorly; vertical large, six-sided, with a very obtuse angle in front, somewhat converging sides, and with nearly a right angle behind; one occipital is about the same size as the vertical, each reaches down to the superior postocular and is rather broadly truncate behind. Nostril between an anterior large and a posterior somewhat smaller shield; loreal squarish; two præ-oculars, the upper is long, while the lower has the appearance of being only a small detached portion of the fourth labial; two postoculars; temporals 1 + 2 + pl., the last is somewhat irregular and scale-like, the first obliquely in contact with both postoculars. Eight, rarely nine, upper labials, the fourth and fifth under the orbit, sometimes a small portion of the fourth is detached, touching the orbit as a separate shield. Mental shield small; nine lower labials, those of the first pair form a suture; anterior pair of chin-shields largest, each in contact with four labials; second pair much smaller, and separated by other two somewhat smaller pairs following each other from the first ventral. Scales smooth, in nineteen rows; ventrals 178 to 205, distinctly angular at the sides; anal entire, moderately enlarged; subcaudals bifid, in 57 pairs.

The general coloration of the upper side is sandy brownish; head with the usual dark brown markings; the first band crosses the eyes and reaches forward to the rostral; the second ascends across the angles of the mouth to the outer median edge of the occipitals; the third is thick, arrow-shaped, anteriorly prolonged to between the eyes. Body with twelve or thirteen dark cross bands, each composed of four confluent spots, the two dorsal ones being larger and darker; tail with four or five cross bands. Between each two of these bands the scales, following alternately each other, are partially blackish, forming three undulating cross lines in each interspace. The sides

along the ventrals are checkered with blackish brown; lower labials with their hinder edges blackish. Lower side dusky yellowish, tinged with red which passes into vermilion on the posterior half; every second or third ventral has a quadrangular black spot at each of the outer edges, the interposed edges being white, and the spots are somewhat more distant on the ventrals than on the caudals.

The total length (in two specimens) is 9.5 inch., the tail being 1.75. I have received one specimen from Penang and Mr. Wood-Mason lately obtained a second one from Jahore, North of Singapore.

This is the fourth species of a small group of *Simotes*, all of which are closely allied to each other and all belong to the Malay or Chinese fauna: they agree in their small size, short and stout body, in the form of the head-shields and in coloration. *S. Cochinchinensis*, Günther, has twenty-one rows of scales round the body. *S. brevicauda*, Steindachner, (Novara Rept. p. 61, pl. iii, figs. 13—14) has, like *catenifer*, nineteen rows of scales, but the occipitals and oculars are in the former somewhat differently shaped, the markings on the head are also somewhat different, and there are no lateral spots on the ventrals; in every other respect both species almost perfectly agree, as far as I can judge from the figure and description, and if I had not obtained two perfectly like specimens of *catenifer* from different localities, I would have hardly ventured to separate them as distinct. The fourth species is Ján's *S. ancoralis*, which has the black spots on the edges of the ventrals, but only seventeen rows of scales round the body and only one præ-ocular.

CYCLOPHIS TRICOLOR.

Schlegel, Phys. Serp. II, p. 187, pl. vii, figs. 16—18; *idem*, Dum. and Bibr.; Günther; Ján, Oph. Livr. 31, pl. vi, fig. 2.

One specimen measures 18.5 inches, of which the tail is 7 inch. Scales smooth, in fifteen rows, vent. 144, anal bifid, subcaudals 129. Greyish, or rather olivaceous, brown above, yellowish white below, a black streak from the nasal through the eye to the side of the neck, rapidly disappearing on the anterior part of the body. Each six-sided scale, above, has the anterior lateral margins pale, producing longitudinal zigzag pale lines; upper labials yellow; along the edges of the ventrals and sub-caudals runs an indistinct dusky line, and another interrupted one along the middle of the ventrals, these lines begin to appear a short distance from the neck, which is below and at the sides uniform yellowish.

The fine zigzag pale lines of the upper side are indicated in Ján's figure. Both in structure and coloration the Sumatra specimen agrees with Schlegel's figure and description, except that the head is a little more slender. This specimen had a large spider in the stomach. Schlegel's snake was

from Java and the species has, I think, not yet been recorded from anywhere else.

ABLATES FLAVICEPS, (*var.*), Günther.

Ann. and Mag. Nat. Hist. vol. XVIII, 1866, p. 26, pl. vi, fig. B.

One specimen agrees well with Günther's description and figure of this snake, but it has nine upper labials, the second being replaced by two, so that the 4th, 5th and 6th labials enter the orbit. The hinder chin-shields are almost in immediate contact with the first well marked ventral. Total length 16·7 inch., of which the tail is 5·5 inch., being somewhat obtuse at the end; scales in 17 rows, one præ- and one or two post-oculars, 150 ventrals, anal bifid, 70 subcaudals.

Head yellow, somewhat tinged with brown in front, a straight black streak through the eye and a white one along the upper labials. The general colour of the upper side is brown, powdered with grey; a light blue band begins on each side of the neck, continuing on each side of the back, the colour gradually turning to grey, but both bands remain tolerably distinct to the tip of the tail. On the front part of the body each is marked with squarish black spots along the inner edge, further on the spots become smaller, alternate in position on the two sides, but are somewhat removed from the internal margins towards the middle line. Below, yellowish, all the ventrals, (except those on the neck), with narrow blackish hind edges about the middle of the body, almost meeting in the centre, but further on the black becomes more confined to the outer margins, and on the subcaudals it forms a serrated black band on either side, as in *Ablates melanocephalus*, to which the present species bears a very strong resemblance. Dr. Günther mentions in his specimen only the presence of a black spot on either side of the ventrals.

GONYOSOMA OXYCEPHALUM.

A very large specimen, measuring about five feet, has the scales round the body in 27 series; it is sea-green, the tail strongly tinged with rubescent brown, the sutures of the scales being blackish; the dark streak on the side of the head is very indistinct; upper labials whitish green.

DENDROPHIS CAUDOLINEATUS.

Dr. Günther when noticing my paper on Penang Reptiles in the Zool. Record for 1870, says that I described his *D. caudolineolatus* (from Ceylon), as *D. caudolineatus* of Gray. I should have hardly expected such a brief dismissal of the consideration of all other points connected with the identification of this species. Dr. Günther appears to have noticed merely my statement regarding the thirteen rows of scales round the body, and to this one charac-

ter he seems to have sacrificed everything else. Now the Penang species, of which I lately also received four beautifully preserved specimens from Sumatra, has only *thirteen rows of scales*. Cantor's description of the snake is admirable, and he gives also thirteen rows of scales. Dumeril and Bibron, when describing their *D. octolineatus*, also speak of only thirteen rows, and Ján (Ophid. Livr. 31, pl. II,) gives the same number of scales when figuring the species under Dum. and Bibron's name.

Thus the question to be determined is, whether Gray's type has thirteen or fifteen rows of scales round the body? If fifteen rows are present, we have to see whether we are entitled to regard this number as a normal or abnormal one in that particular specimen, that is, whether other specimens from the same locality have 13 or 15 rows of scales; for as far as other points of structure and coloration go, the Penang and Sumatra species is absolutely identical with Gray's *caudolineatus*. I have no Bornean specimens for comparison, so I can add nothing more towards the solution of the question.

The Ceylonese *D. caudolineolatus*, as far I can judge from the description and figure of it, differs in the structure of the præ-ocular, in the upper labials, and so very essentially in coloration, that I could not have thought of identifying the Penang *caudolineatus* with it.

OPHITES SUBCINCTUS.

One specimen measures eighteen inches, of which the tail is 3.25 inch. The general colour of the upper surface is black, slightly duller at the sides, dull olivaceous blackish below; front head above blackish brown; seventeen broad white rings round the body, the first on the neck, and four on the tail; the white of the rings is considerably more distinct on the anterior than on the posterior part of the body. The eight median rows of scales on the back are keeled; eight upper labials, regular on both sides.

OPHITES ALBOFUSCUS.

A remarkably slender snake, measuring 18.75 inches, of which the tail is 5.75 inch. It has seventeen rows of scales, all strongly keeled, the keels on the back being finely crenulated. The general structure exactly agrees with Günther's account of the species. The specimen has 241 ventrals, anal bifid, and 178 subcaudals, the last shield is single, very long and cylindrical.

The general colour is dark brown above, olivaceous white below; hind head and collar on neck very slightly olivaceous white tinged with yellow; body with twenty-six transverse white cross bands, some are imperfect, the intermediate brown bands of ground colour being first thrice, afterwards only twice as broad as the white ones. Tail with about twenty-six transverse white bands, several of them succeeding each other being often

confluent along the middle line, and all are about equally broad as the brown bands separating them; towards the tip of the tail the light coloration prevails and almost entirely suppresses the dark one.

Mr. Stahlknecht obtained only a single specimen near Dilli on Sumatra. Dumeril and Bibron also described a specimen from Sumatra; another one is reported by Dr. Günther as having been brought from Malabar, but as it was bought from a dealer, the locality is not considered reliable.

HIPSIRHINA [FERANIA] ALTERNANS, Reuss.

Eurostus alternans, apud Dum. and Bib., *Herp. Gen.*, VII, p. 957.

Homalopsis decussata, Schlegel.—*Hipsirhina alternans* apud Ján, *Ophid.*, Livr. 30 pl. vi, figs. 1 and 2.

One specimen measures: total length 8.25 inches, the tail being one inch. It has two anterior frontals, the first scarcely half as large as the posterior, vertical six-sided, much smaller than one occipital; one loreal, one præ-ocular, two post-oculars; seven upper labials, the fourth under the orbit; the two first lower labials are in contact; two pairs of chin-shields, the first forms a suture, the shields of the second pair are much smaller, diverging and with their upper pointed ends lying between the first chin-shields and the labials. There are twenty-six rows of scales immediately behind the head, twenty-two round the neck, below interrupted by the second ventral, and nineteen round the middle of the body, ventrals 157, anal bifid, subcaudals thirty-four, the first five entire, the last conical.

General colour brown; head, above, anteriorly with a few pale spots; back with narrow pale (yellowish) cross bands: the first passes over the hind-edges of the occipitals and is laterally bipartite, the next four are simple and complete, the following after these mostly interrupted along the centre, and after the middle of the body the bands become reduced to indistinct lateral spots. The sides of the body are marked with a series of pale yellow cross-bars, more than one scale broad, and are separated by equally broad bands of the general brown coloration; the lateral pale bands more or less encroach upon the ventrals, but the general colour of these latter is pale brown. Chin and upper labials spotted with yellow.

This coloration slightly differs in minor details from that given by Ján, but it agrees with it in all essential points.

The larger size of the occipitals as compared with the vertical, the smaller number of upper labials and of the scales round the middle of the body, and the coloration readily distinguish the present species from *F. Sieboldi*.*

* Günther, in *Ann. and Mag. N. H.*, 1866, xviii, p. 28 and in *Zool. Rec.* for 1868 says, that Ján figured *F. Sieboldi* as *Hypsirohina Bocourti* (*Iconograph. Livr.* 28, pl. v, fig. 2). Ján's *H. Bocourti* has apparently only 23 or 25 rows of scales round the body,

TRIMERESURUS WAGLERI.

Fresh specimens are black above, with numerous spots on top of head, the superciliary edges, both lips, numerous narrow cross bands and the whole of the lower side bright golden yellow with a greenish reflection during life; the stripe from the nostril to below the eye, continuing above the angle of the mouth, one stripe on each side along the margins of the labials, and all the other light spots on the back, but particularly at the sides, are sea-green; more or less tinged with yellow.

NOTES ON THE INDIAN SPECIES OF THELYPHONUS,
by DR. F. STOLICZKA.

(Received 23rd February, 1873, read 5th March, 1873.)

[With plate XII.]

Towards the end of last year, a monograph of the genus *Thelyphonus* appeared in the September number of the *Annals and Magazine of Natural History*. The author of the paper, Mr. A. G. Butler, seems to have sifted well the materials of the national collection in the British Museum, but whether he has succeeded in his determinations of known, described and figured, species, is a question on which I may be permitted to say a few words. I will not unnecessarily transgress the field of my observations, and will chiefly confine my remarks to the Indian representatives of the genus.

I had for some little time devoted attention to these Arachnoids, and it has been my intention to publish a detailed monograph of the Indian *Thelyphoni*, together with an account of their anatomy,* notes on their habits, propagation, development, etc., all points about which our present knowledge is as yet very imperfect. Unfortunately, I have just at the present neither the time nor the materials which would justify me to treat satisfactorily with this subject, and I must leave it, therefore, for a subsequent communication. One of the chief objects of the accompanying notes is to draw the attention to certain discrepancies, or perhaps insufficiencies, in Mr. Butler's determinations of a few of the Indian *Thelyphoni*.

the coloration is somewhat similar to that of *F. alternans*, the occipitals are much longer than the vertical, and there is only one anterior frontal, this, however, is also said to exist in an old specimen of *Sieboldi* from Siam. Still I am not certain that Günther's suggested identity of the two snakes will be confirmed.

Ján does not acknowledge the distinctness of *Ferania* from *Hipsirhina*, and if *F. Sieboldi* has occasionally only one anterior frontal, the principal reason for keeping the two genera as distinct no doubt loses its validity.

* As compared with that of the Scorpions.

Lucas' account of the external anatomy of *Thelyphonus* is the only reliable one which we as yet possess. Short as it is, it clearly points out the great relation of the genus to *Phrynus*, and its essential difference from the scorpions.

As regards general distribution, I may say, that on the whole, particularly when compared with scorpions, the *Thelyphoni* are rare. I have only observed two life species, *T. scabrinus* and *T. (conf.) angustus*. Both were found at the foot of the Sikkim hills in damp places under the bark of old trees. They are crepuscular or nocturnal animals. When disturbed during the day, they try rapidly to escape, slightly raising themselves on their feet, holding up the cheliceres ready for defence, and erecting their caudal seta. Thus they progress very fast and soon disappear in any crevice or hole to which they find easiest access. In the evening they progress very quietly, moving their antennular first pair of feet in advance. When disturbed they stretch out these feet in a curve, and close their cheliceres over the mouth as a kind of protection, lying at the same time quite flat and motionless. I saw *T. scabrinus* issuing a peculiar fluid from two internal piloric appendages on each side of the anus, but the fluid did not have any offensive odour.

Mr. Peal of Sibsagar (Assam), who is an able observer and is always ready to give assistance on any subject connected with natural history, writes to me also that the *Thelyphoni* are generally found underneath the bark of decayed wood in groups, rarely singly. When first uncovered they (generally) lie *perdu* and try to pass as some smudge or fungus; lying close and flat, the legs gathered well together and the cheliceres folded in and closed in front of the mouth. On being disturbed they generally start up, throw out and up their cheliceres, gaping wide, erect the tail and invert it so as to feel if possible any object above them; sometimes they throw it quite over between the cheliceres. The first pair of feet, he says, seems to act more as feelers than as organs of progression. These animals seem to move either very slowly or very fast. In raising any fragment offered, they hold it aloft and stand well upon their legs, at least for a time.

Mr. Butler proposed to group the *Thelyphoni* in three sections, according to the number of denticles on the upper antero-interior edge of the second joint of the cheliceres. This is apparently a character of great importance, but like all others it is not without variation. I found that the relative proportions of the joints, particularly of the second, third and fourth, are almost more constant than the denticles alluded to. The form of the large spine on the fourth joint, and in fact the total length and ornamentation of the surface of the cheliceres, and the proportionate length of the feet are at least equally important in distinguishing the species.

The next useful character lies in the form of the anterior part of the thorax, whether it is depressed or rounded, and whether the anterior and lateral eyes are connected by a ridge or not. Next in importance is the form of the first abdominal shield. The length of the tarsi on the first pair of feet is also tolerably constant, and so is the form of the mandibles, but these, as a rule, are difficult to examine.

All other characters relating to the form of the body have a comparatively limited value; the single parts are very uniformly constructed in the different species, and are at the same time very much liable to variation. Thus the width of the abdomen is very variable, (most likely according to the different sexes), and so is the length of the abdominal seta, as regards number and size of the separate joints, etc.

Turning now to the sections, distinguished by Mr. Butler, there are some discrepancies to be noticed in the species referred to them by the author. In the first section, with five denticles on the second joint of the cheliceres, we find among others:

T. Brasilianus. I count in Koch's original figure of the species at least seven, almost equal, denticles on the antero-interior edge. Their number, it is true, is not mentioned in the description, but if Koch's figure has been found to be incorrect, the correction should have been noticed. I am not aware that anybody has pointed out an inaccuracy in Koch's figure.

Guerin's *T. caudatus* (in his edition of the *Régne animale*) is identified with *T. Antillanus* of Koch. This is, I think, hardly admissible. Guérin's figure represents a species with comparatively shorter limbs and with the third joint of the cheliceres smooth on the upper surface and much longer, than a comparison of Koch's figure of *T. Antillanus* can bear out. The only reason for the identification of the two figures is, I think, Guérin's note that *T. caudatus* is from the Antilles, but whether that particular specimen was from the Antilles is another question.

The identification of *T. Assamensis* with *T. rufimanus* of Lucas is entirely inadmissible, as I shall point out in detail further on (see p. 134).

T. proscorpio of Latreille is an altogether doubtful species, and even should Koch's definition of the presumed same species be adopted, there is no sufficient reason for considering it as identical with *T. caudatus* of Lucas. I shall refer to this question again in the description of *T. scabrinus* (see p. 133).

T. Linganus. Koch's original figure gives six denticles on the second joint of the cheliceres, but does not refer to that number in the text. Is the figure incorrect in that respect?

Koch's *T. rufipes* is clearly not the same species as the one originally described by Lucas under the same name. The cheliceres and the limbs are in proportion to the body much longer in the former than in the latter; and, besides that, Koch's species has a slight central keel on the upper side of the

abdominal segments, and on the lower side the first segment is centrally grooved; neither of these characters are mentioned by Lucas, though when describing the respective parts he could hardly have overlooked these prominent characters. I consider Koch's *rufipes* as the same which he describes under the name of *proscorpio*; for the differences which he notices as distinguishing the two are decidedly of no specific value.

• In the second group with two denticles on the second joint of the cheliceres, Butler describes *T. formosus*. My specimen of evidently the same species has six denticles of which, however, only two are well marked.

In the third division, including species with six well developed denticles, one is referred to under the old name of *T. caudatus*. I shall attempt to trace the history of this name when speaking of *T. indicus*, (n. sp.), which is possibly the same species as the one referred to by Butler from Madras and Bengal under the name of *T. caudatus*.

In addition to the three sections, I have one species, *T. Beddomei*, from the Anamallies, with seven denticles on the upper edge of the second joint. Among the very large number of specimens of *T. scabrinus*, (n. sp.), I found instances in which the second left joint has occasionally six denticles, while the right one had constantly only five. This clearly shews that the sections solely based upon the character, selected by Mr. Butler, can have only a very limited use.

Thus far I have commented upon Mr. Butler's determinations, but it must be understood that in the above instances my observations are mainly based upon descriptions and figures; for I have no other but Indian specimens for comparison. If those descriptions and figures were found to be incorrect, or not reliable, the mistakes had first to be pointed out and corrected, before a determination, based upon them, was admitted or rejected.

Finally, before entering upon the specific details, I must briefly allude to the geographical distribution of the genus. This distribution extends from South America and the West Indies northwards to Mexico, in a westerly direction through the ocean of little islands to the Philippines, touching North Australia, and stretching North as far as Corea, China and through the Malay Peninsula to Burma and India, where we meet with most of the species in the provinces of Assam and Sikkim, more rarely in Bengal and in South India, including Ceylon, all countries which have a marked admixture of Malayan types. No species is known to occur westward of the country alluded to, not even in Eastern Africa, as far as we know at present. This distribution resembles in so many respects that of the *PASSALIDÆ*, that I shall again return to its discussion at an early opportunity.

The species which I have to notice from India, are :

1. *T. scabrinus*, n. sp.—Cachar, Khasi hills, Assam, Sikkim.
2. *T. Assamensis*, Stol.—Assam, Sikkim.
3. *T.* (conf.) *angustus*, Lucas.—Sikkim, Martaban (Moulmein), and Penang.
4. *T. formosus*, Butler.—Martaban (near Moulmein).
5. *T. indicus*, n. sp.—South India, W. Bengal, and Jahore, North of Singapore.
6. *T. Beddomei*, n. sp.—South India (Anamallies).

I will make my descriptions as complete* as possible, and will not only give figures of single parts of the body, but also of the perfect specimens, in order to facilitate the determination by identification and not by guess. Figures of single parts are undoubtedly very useful, but they are not sufficient; they do not convey an exact idea of the relative proportions of all the parts of the body, and without paying due regard to these, a really reliable determination of *Thelyphoni* is in my opinion impossible.

1. *THELYPHONUS SCABRINUS*, n. sp. Pl. XII. Fig. 1.

The whole upper surface granular; length† of the five terminal joints of the cheliceres equalling the length of the first eight abdominal segments; the length of last pair of feet equals exactly, or very nearly, the total length of the cephalothorax and abdomen; second joint of the cheliceres with five spines, third with a spine on the upper and lower inner edge, and equal in length to the fourth joint; a sharp upper ridge connecting the central and lateral eyes; first lower segment of abdomen of moderate size, depressed, with a broadly convex posterior edge.

Hab.—Sikkim, Assam, Garo-, Khasi- and Cachar- hills.

The cephalothorax is slightly convex, with the anterior ocular portion somewhat higher, but on the whole depressed and flattened, roundly obtuse in front. The two anterior blackish eyes are separated by a moderately levated smooth tubercle; from its anterior edge proceeds a sharp ridge curving outward, and running along the upper edge to the three lateral eyes, which are pale yellow. The ocular portion is more densely and somewhat more coarsely granular than the thoracic one; the former has a longitudinal central groove,‡ and parallel to it an indistinct elevation on either side, placed nearer

* I know that few would take the trouble of reading them on account of their length, but everybody, who has attempted to determine Arachnoids, will know that a description, unless fully detailed, is worthless for an accurate determination.

† This length is of course measured as far as the joints can be opened without disconnecting the articulation; it is not the aggregate length of the separate joints.

‡ I shall speak of this as the *cephalic groove*, and of the one on the posterior half of the cephalothorax as the *thoracic groove* and the *lateral thoracic depressions*.

to the margins ; the latter has also a longitudinal groove which is most depressed in the centre ; anteriorly from the central depression proceed two lateral grooves to the postocular depressions, and from the centre itself two on either side towards the margin. The sternum is triangular, obtuse in front.

The abdomen is moderately depressed, very elongately ovate, across the middle about one-twelfth of an inch broader than the thorax ; granular above, with the posterior segmental edges crenulated ; the muscular points* are round and well marked on the second to eighth segment, the three last segments are mostly smooth, the last joint being roundly compressed towards the upper end, with a small vertical and elliptical gland on either side. Below, the first nine segments are finely scrobiculate punctated at the sides, and smooth along the centre ; the first joint is largest, equalling in length the three last ones, with the central portion of the posterior edge somewhat convexly produced ; the second joint is barely curved at the edge and the third, like the succeeding, quite straight. The muscular impressions are elongate and well marked on the fourth to seventh joints, but a little less distinct and more approximate on the first and second joints. The caudal seta very nearly equals in length the whole of the body, it is always peculiarly attenuated towards the end, and all the joints are more or less hairy. The length of the joints and their number is very variable ; the first is as usually the longest, the succeeding either gradually decrease in length, or some of them situated near the middle are longer than the rest.

The cheliceres may be regarded as of proportionate size to the body. The two first joints have each a strong spine in front, provided with a sharp joint and a small denticle on the inner side. The second joint has the upper side depressed, anteriorly moderately produced, with three small denticles on the inner edge, and two larger ones on the anterior one ; the outermost larger denticle is somewhat more distant from its preceding one, than any of the others from among each other, but all are directed forward and inward ; the inner concave side of this joint is coarsely granular, and the lower anterior corner has two denticles, of which the terminal one is the larger. The third joint on the upper side is equal in length to the second, and laterally along the middle to the fourth ; it always has a small denticle on the inner anterior corner, and a larger one in front of the middle of the lower edge. The anterior process of the fourth joint equals in length the fifth joint, it is depressed, smoothish, with a rapidly contracted sharp point and serrated edges, the posterior serration being slightly coarser

* These points or depressions are very often called stigmatic points, but they have nothing in common with the stigmata, which lie under the edge of the first lower abdominal segment, and are not externally visible ; the depressions are merely places of the inner attachment of the muscular bundles which connect the upper chitinous integument with the lower one.

and beginning with two somewhat larger denticles at the base of the process; this fourth joint also has a minute denticle on the lower anterior corner. The fifth joint is invariably conspicuously shorter and thinner than the fourth, anteriorly with a strong depressed, sharply pointed process which is somewhat more coarsely serrated posteriorly than anteriorly; the lower anterior corner of this joint has two denticles, the anterior of which is somewhat stronger than the corresponding denticle of the preceding joint. The sixth joint, or movable claw, is somewhat longer than the process of the fifth, slightly inwardly curved, sharply pointed, above and below with a finely serrated edge, internally on the concave side with a smooth ridge, and two equally smooth ones are externally on the convex side.

The first pair of feet are thin; the terminal eight tarsal joints are shorter than the preceding metatarsal one. The coxal and femoral joints of the three other pair of feet are thick, depressed, very densely and finely granular.

Colours. Full grown specimens are above brown, slightly darker on the cephalic portion of the thorax and on the cheliceres, except near their ends; all the feet from their tibial joints to the end are red, and each joint of the three posterior pairs has near its terminal upper edge a black dot; the last joint of the maxillæ, the ocular tubercle and the claws are black. On the lower side the cheliceres, the prosternum, the abdomen are more or less dark brown, the coxæ of the feet and the sternum are yellowish brown and the feet reddish brown.

The following are the dimensions of a specimen of very nearly the same size as the one figured by Koch as *T. proscorpio*.

Total length of cephalothorax and abdomen,	37 mm.
Length of cephalothorax,	13.6 "
" " abdomen, including the three terminal joints,	23. "
" " cheliceres, measured above, without basal joint,	17.5 "
" " first pair of feet, excluding the basal or coxal joint,	44. "
" " second ditto,	25. "
" " third ditto,	26.5 "
" " fourth ditto,	36. "
" " abdominal seta, ditto,	36. "

In young specimens (with a total length of about 20 mm.) the abdomen is often slightly longer in proportion to the length of the cheliceres, but there is not the least difference in structure. The body and cheliceres are olivaceous brown, the process of the fourth joint, the whole of the fifth and sixth joints of the cheliceres red; coxal and femoral joints of all feet olivaceous, the remaining joints and the seta yellowish red. On the lower side, the basal joint of cheliceres is pale brown with the spinal processes red, the three following olivaceous brown, the two terminal red; prosternum

olive brown, coxæ and sternum yellowish brown, abdomen pale brown, feet of the same colour as on the upper side.

The species grows to a large size: the largest specimen from Sikkim has the total length of cephalothorax and abdomen 50 mm.

In Sikkim the species is found from 1000 to about 4000 feet in damp places under wood, more rarely under stones. It is the most common of all the Indian *Thelyphoni*. I have examined about forty specimens of all sizes from 20 to 50 mm., and all exactly agree in structure.

It seems very improbable (judging from the localities recorded by Mr. Butler) that there should be no specimens of this species in the British Museum, but I am not certain whether Mr. Butler refers to it under *T. rufimanus* or *proscorpio*. He must have thought it not worth while reading my description and comparing my figure of *T. Assamensis*, or else he could not have referred it to the present species.

The original name *T. proscorpio* of Latreille (Gen. Crust. et Insect., 1806, p. 130) was, strictly speaking, proposed for Linné's *Phalangium caudatum*. In spite of the numerous references to figures in various old books, it is entirely impossible to trace the species which Latreille had in view. The name would have had to be entirely ignored, but for its timely rescue by Koch who figures a Javanese species under Latreille's name, giving the same synonyms, (Arachniden, Vol X, p. 26, pl. 333, fig 771). Judging from mere figures, we are, I think, justified to regard the species, delineated by Koch, as different from Lucas' *Th. caudatus* (to which I shall refer further on). Koch's *proscorpio* would appear to have the joints of the cheliceres shorter and thicker, the fifth much stronger than the fourth, (while the reverse is observed in Lucas' figure), the centre of the anterior upper abdominal joints keeled, the first, lower abdominal joint very large and with a longitudinal groove. I hardly think that Lucas could have overlooked the last character, when describing the first lower abdominal joint; and besides that in his species he particularly refers to a separate small spine preceding the great spinal process on the fourth joint of the cheliceres; it is indicated in his figure, but not a trace of it is to be seen in Koch's figure. For these reasons, it seems to me clear that we have to consider Latreille's re-established *Th. proscorpio* as distinct from Linné's re-established *T. caudatus*.

Butler also doubtfully refers Lucas' *T. angustus* to his compound mixture of *Th. proscorpio*, but with still less reason, as I shall presently shew.

2. THELYPHONUS ASSAMENSIS, Stol. Pl. XII. Fig. 2.

T. Assamensis, Journ. A. S. B. Vol. xxxviii, Pt. II, 1869, p. 205, pl. xix, fig. 1.

The whole upper surface granular; the length of the five terminal joints of the cheliceres fully equals the first nine abdominal segments; the last foot is

longer than the cephalothorax and abdomen together; second joint of cheliceres with five subequal spines, four being on the inner, one somewhat more distant on the upper anterior edge; third joint with a single strong spine on the lower median edge, it is longer and slenderer than the fourth joint, whose anterior process is long, subcylindrical, smooth posteriorly, denticulate on the antero-interior edge; a sharp denticulate ridge connects the central with each group of lateral eyes; first lower abdominal segment depressed, particularly in the middle, with the posterior edge convexly produced.

Hab.—Assam and Sikkim. The species is much rarer than the previous.

It will be seen from this abbreviated characteristic that the species is very closely allied to the previous, but after having examined several specimens of each, exactly agreeing with each other, I think they must be looked upon as two distinct species. I have already given a detailed description of the present one.

In size and coloration it almost exactly agrees with *T. scabrinus*, but is slightly more depressed, the cheliceres are somewhat more slender and longer. The spines on the second joint are subequal, four on the inner edge, and one distant one on the upper edge; the form of the third joint and the process on the fourth differ essentially, as may be readily seen by a comparison of the enlarged figures of the respective cheliceres. The feet are also proportionately longer than in *T. scabrinus*; the eight tarsal joints on the first pair equal in length their preceding metatarsus. Internally along each group of lateral eyes are two imperfect ridges of granules somewhat parallel to the central cephalic groove.

As regards general form and proportional size of the joints of the cheliceres *T. Assamensis* is also closely allied to *T. caudatus*, as emended by Lucas, but the denticles on the second joint are very different.

Butler (loc. cit. p. 202) considers *T. Assamensis* as the adult of *T. rufimanus* of Lucas. If such identifications were admitted, we might better give up the idea of distinguishing at all species of *Thelyphoni*; a superficial comparison of the respective figures will shew that the cheliceres and limbs of *T. Assamensis* are proportionally very much longer, than could possibly be attributed to a change in age. Lucas particularly refers to the shortness of the cheliceres* in his description of *T. rufimanus*, their third joint is said to have no spines whatever; the first lower abdominal segment is stated to be very large. Besides that it appears to me, judging from the figure, that there is in Lucas' species no sharp ridge between the central eyes.

3. *THELYPHONUS (conf.) ANGUSTUS*, Lucas. Pl. XII. Fig. 3.

? *T. angustus*, Lucas, Guérin's Mag. de Zool. for 1835, pl. 10, fig. 3.

Cephalothorax and abdomen long and slender, finely granular above; cheliceres in young almost entirely smooth, in old specimens with the exception of

* They are much shorter than the abdomen.

the second joint mostly smooth, the length of the five terminal joints is about equal to that of the first six abdominal segments, which is slightly more than the length of the cephalothorax; the length of one of the last feet, or that of the caudal seta, is considerably less than that of the cephalothorax and abdomen together; cephalic portion of thorax at the sides between the central and lateral eyes rounded; second joint of cheliceres with five denticles, of which the two uppermost are subequal and larger than the three others; third joint not longer than the fourth, with a denticle on both the upper and lower inner edges; first lower abdominal segment depressed, with the posterior central edge somewhat narrowly produced.

Hab.—Penang, Moulmein, and Pankabari (Sikkim).

I have six specimens for examination, two from each locality; they all agree in the above characters, and appear to me to be referable to Lucas's species.

The slenderness of the body and the shortness of the cheliceres are very striking distinctions as compared with the two preceding species. The cephalothorax is only about half the total length of the abdomen, with the anterior end somewhat narrowly rounded, convex above, the cephalic portion being more distinctly, though still very finely, granular than the thoracic one; the median ocular tubercle is low, rounded, smooth; the central eyes small, black; the sides between them and the lateral amber-coloured eyes rounded, with a slight longitudinal elevation above the latter. The cephalic groove is distinct, beginning a short distance behind the ocular tubercle. The central thoracic impression is rather large, with a very fine groove passing through it; lateral impressions rather indistinct. Prosternum on the face obtusely keeled with a short anterior broad point; sternum ovately subtriangular, smooth, anteriorly subtruncate.

The first nine abdominal shields are on the upper side very finely granulated, with slightly raised lateral and posterior edges. The muscular rounded pits are well marked from the second to the eight segment. The lateral kin is densely and very finely punctated and scrobiculate. The first segment has the middle of the posterior edge narrowly produced, and its length laterally is equal to that of the two succeeding ones, all three are broadly laterally punctated, smooth in the middle, while the other segments are mostly smooth, with only a few fine scattered dots.

The caudal seta is always shorter than the total body; it is distinctly hairy in young specimens, but the hairs easily wear off in adults.

The cheliceres are almost quite smooth in young specimens, while in adults the second joint is on the upper side densely punctated, the other joints are very sparingly covered with hair, these becoming, however, more numerous towards the tips. The first joint is flattened, with two anterior diverging processes, each terminated by a short spine, which has the appearance as if it had

been set into the abbreviated end of the process. The remaining five joints are in form, relative size and denticulations, exactly like those of *Th. scabrinus* on a small scale, with the single exception that, as already observed, they are mostly smooth. The eight tarsi of the first attenuated pair of feet are considerably shorter than the preceding metatarsus. The remaining feet have the femoral joints depressed and finely granular above.

Colour of adult, above, blackish brown, somewhat less pure on the abdomen and with the three terminal joints of the cheliceres reddish brown, coxal and femoral joints of all feet olivaceous brown, remaining joints bright red; lower side entirely reddish brown, only the second and third joints of the cheliceres, the points or denticles of all the other joints, the prosternum, the femora, the external margins of the abdominal segments, including nearly the whole of the four terminal ones, are blackish; the shades of brown, however, slightly differ: the last joint of the cheliceres being rather bright red, the first pair of feet reddish brown, the coxæ and sternum yellowish brown and the abdomen chesnut brown; the seta is reddish brown.

Younger specimens have all the upper dark brown as well as the lower reddish coloration paler, but the ends of the cheliceres are bright red and the feet and caudal seta yellowish red. In the four specimens from Sikkim and Penang the femoral joints of the first pair of feet are dark, in the two specimens from Moulmein the whole of these feet are reddish brown.

The largest specimen from Sikkim measures:—

Total length (excluding the seta),	31	m.m.
Length of five terminal joints of cheliceres,	11	" "
" " cephalothorax,	10	" "
" " abdomen,	20	" "
" " first pair of feet (excluding the coxa),	26	" "
" " second,	16·5	" "
" " third,	17·5	" "
" " fourth,	25·5	" "
" " caudal seta,	26·5	" "

A comparison of my figures and description of the present species with those of Lucas (loc. cit.) will show, that the form of the body, the proportions of the different joints and the coloration agree as closely as could be expected, so much so that I can scarcely doubt the identity of the two. There is only one point in Lucas' description which, although in itself apparently of no very great importance, is contradictory to what can be observed in my specimens. Lucas says that the third joint of the cheliceres is smooth on the upper inner edge, and provided with a spine only on the lower edge, while in all my specimens there is a distinct though very small spine on the upper edge and a somewhat larger one on the lower. As Lucas' type is in the Paris Museum, it will be comparatively easy to settle this point by a re-examination of the specimen.

4. *THELYPHONUS FORMOSUS*, Butler. Pl. XII. Fig. 4.

Ann. and Mag. nat. hist. 1872, vol. x, p. 203, pl. xiii, fig. 4.

Upper side of body finely granular, of cheliceres nearly smooth, length of the five terminal joints of cheliceres very nearly equalling that of the first nine abdominal segments; second joint of cheliceres on the upper anterior edge with six very small denticles, of which only the two middle ones are pointed, fourth and fifth joints more swollen than the two preceding ones; edge between the central and lateral eyes swollen, rounded, not carinated; length of one of the last feet almost exactly equals the cephalothorax and the abdomen; first lower abdominal segment very large, with the median posterior edge produced, but still truncated, and depressed.

Hab.—Moulmein, (in the Martaban province).

The cephalothorax is comparatively small, its length being only slightly more than half that of the abdomen; it is convex, anteriorly somewhat narrowly rounded, with the cephalic portion behind the ocular tubercle transversely rugose, further on rugosely granular, the granulation being considerably stronger than on the thoracic portion. Ocular tubercle and central eyes small, black. Cephalic groove with slightly raised margins. Edges beginning a short distance behind the central eyes and extending to the laterals broadly rounded and swollen. Median and lateral thoracic grooves and impressions narrow, but distinct and shining smooth. Prosternum narrow, subcarinate; the sternum rather elongately trigonal, anteriorly obtusely rounded, with the sides posteriorly sloping.

The first nine upper abdominal segments very finely granular, with crenulated posterior margins; the muscular rounded pits are distinct on the first eight segments, the three last narrow segments are smooth. Sides punctured, and with small scattered elongated tubercles, of which a median row slightly exceeds the others in size. On the lower side the two first segments are strongly rugose at the sides, the others only punctated, the median portions being smooth, except on the narrow second and third segments on which the punctuation extend almost to the centre. The first segment is largest, with the posterior part centrally produced, but with the edge truncate. The first pair of feet is entirely smooth, the second and third have the femoral joints, and the last all the joints, scrobiculate punctated, the punctuation extending even to the hinder sides of the coxæ.

The cheliceres are sparsely hairy, except on the inner sides and near the tip. Each first joint has anteriorly a strong sharply pointed process. The second joint has on the upper margin six denticles, four being on the inner edge,—the two lower obtuse, the two upper pointed and longer,—the fifth and sixth are on the anterior edge, both very small and indistinct, the last is distant from the rest; the anterior half of the joint is transversely rugose; the lower anterior edge has two subequal very small denticles. The third

joint is slender, slightly longer than the second, with numerous sharp granules on the upper rounded inner edge, and one strong spine in the middle of the lower edge. The fourth joint is not longer but considerably thicker than the third, with a long, inner, rather equally slender, smooth, anterior process, with its termination shortly bifid and internally provided with a compressed tubercle. The fifth joint is equal in length to the preceding, but again more inflated, with a short and broad anterior process, sharply serrated on both edges. The sixth joint is moderately curved, externally grooved and with the upper and lower edges finely serrated, and internally pilose.

The length of the eight tarsi of the first pair of feet is less than that of the metatarsus. The femora of the other feet are moderately thickened and depressed.

Colours. Above,—cheliceres and cephalic thorax brilliantly shining blackish brown, remainder of cephalothorax and abdomen dull blackish; maxillæ with the exception of their tips and all feet bright reddish chesnut; caudal seta somewhat deeper red; sides of abdomen fulvous brown. Below,—cheliceres on the first joint dark brown, remaining joint blackish brown, sternum, coxæ and feet reddish chesnut, abdomen darker chesnut.

I have some years ago collected this species near Moulmein, wherefrom Butler's type was received. If the second joint of the cheliceres of the type specimen has no indication of any other but two denticles, the occurrence must be looked upon as an accidental variation. The form of the body and of the cheliceres is so characteristic, that the species cannot be easily mistaken with any other. The following are the dimensions of an apparently full grown specimen:—

Total length of cephalothorax and abdomen,	26	m. m.
Length of the first terminal five joints of cheliceres,	13.5	„ „
„ „ cephalothorax,	9.	„ „
„ „ abdomen,	16.5	„ „
„ „ first pair of legs (without coxæ),	28.5	„ „
„ „ second,	15.5	„ „
„ „ third,	16.5	„ „
„ „ fourth,	24.5	„ „
„ „ caudal seta,	19.	„ „

5. *THELYPHONUS INDICUS*, n. sp. Pl. XII. Fig. 5.

An *Thel. caudatus* auctorum!

Upper side very finely granular; the first nine abdominal segments, centrally, with a partial, very fine carina; cheliceres mostly smooth, except on the second and third joints which are densely punctated; the length of the five terminal joints of the cheliceres equals that of the first seven or seven and a half abdominal segments; the length of one of the last pair of feet is very nearly equal to that of the cephalothorax and abdomen taken together;

a short sharp edge in front of the lateral eyes, not continuing to the central eyes; second joint of cheliceres with six small, subequal denticles, third not longer than the fourth, with a little spine above and below; first lower abdominal segment very large, convex, centrally grooved.

Hab.—South India, Western Bengal, and the Malay Peninsula.

The cephalothorax is rather obtusely rounded, with the perpendicular front side perfectly smooth; the ocular tubercle is also smooth and very high, the circumference round each black central eye being depressed. From the ocular tubercle passes in a curve a rounded edge below the central eye, and after a short distance from this one joins a thin, but sharp and finely serrated, ridge which continues to the lateral eyes; the latter are pale amber yellow. The upper side of the cephalic thorax is flattened, indistinctly granularly rugose, with a rather small central groove. The thoracic portion is very finely granular and most minutely punctated, with the central depressions distinct, but the lateral ones ill-defined. The abdomen is one sixth broader than the thorax, very finely granular, with a fine central carina, scarcely traceable on the fourth and fifth segments; all have a posterior submarginal row of very minute granules; the last three narrow segments are smooth. The first segment on the lower side is very large, smooth, centrally grooved, with the posterior edge somewhat produced and broadly truncate. All the other segments are finely rugose; the second and third being very narrow.

All the joints of the cheliceres are internally distinctly pilose. The first joint is sparingly punctated; on the median anterior part it is transversely rugose, terminating with a sigmoid, pointed process. The second joint has an anterior rounded shovel-like edge provided with six subequal denticles, of which the two outermost are more distant from the other four than these among themselves; on the lower edge there are two unequal denticles. The third joint is short, with a small denticle at the inner upper end and a larger one on the middle of the lower inner edge. Both the second and third joints are densely punctated above and outwardly, and granular below; the following are mostly smooth. The fourth joint is slightly thicker than the third, with a long, pointed, anteriorly and posteriorly serrated process; it has no spine on the lower side. The fifth joint is again somewhat more inflated with a short, broad, depressed process, sharply serrated on both sides; on the front margin of the lower side there is a minute denticle. The sixth joint is slender, considerably longer than the process opposite to it; the upper and lower inner edges are, as usually, finely serrated, and near the tip there is on the upper edge a conspicuously enlarged tubercle.

The tarsi on one of the first pair of feet are shorter than the preceding metatarsus. The femoral joints of the other feet are compressed, granular

above, smooth below; the last foot is very little shorter than the whole body, and the caudal seta fully equals in length the latter, it is multi-articulate and densely pilose.

Upper side of cephalothorax and abdomen dull brownish black; cheliceres shining deep chesnut, feet and seta bright chesnut. Lower side,—cheliceres same as above, feet, sternum and first abdominal shield bright chesnut, rest of abdomen deeper chesnut.

Total length of cephalothorax and abdomen,	35.5 m. m.
Length of the five last joints of cheliceres,	17.3 " "
" " cephalothorax,	12.1 " "
" " abdomen,	22. " "
" " first pair of feet (with coxæ),	38 " "
" " second,	22. " "
" " third,	24. " "
" " fourth,	33. " "
" " caudal seta,	36. " "

The preceding description and the figures refer to a South Indian specimen which I had received from Major Beddome.

Another specimen was collected by Mr. Ball near Sirgúja in Western Bengal. It agrees with the former in every particular, except that the denticles on the second joint of cheliceres are somewhat stronger, and that the fourth and fifth joints are not so much inflated, both being only slightly thicker than the third.

Several other specimens were obtained by Mr. Wood-Mason's collector at Jahore, at the extreme south end of the Malay Peninsula. These also agree in every point of structure, the proportions of the body, &c., with the type form, but the first, second, third and fourth joints of the cheliceres are more densely punctated, while the tumidity of the fifth is intermediate between the South Indian and the Bengal specimen. The six denticles on the second joint of the cheliceres are well developed, and the process on the fourth is a shade broader than in either of the two Indian specimens.

Judging from the references to the two localities Madras and Bengal, it would seem probable that the present species had been alluded to by Mr. Butler under the name *Th. caudatus*, though the remark referring to the broad body and depressed abdomen would rather apply to the next species.

But here the question arises what is *Thelyphonus caudatus* = *Phalangium caudatum* of Linnæus? Mr. Butler (loc. cit.) gives among others as the reference of *T. caudatus* Linné's Syst., and Fabricius' Ent. Syst. If anybody will look through these references, he will, I think, find very little satisfaction in the definition of *T. caudatus*.

As habitat of the species, Mr. Butler gives Ceylon, Madras, Bengal and Tenasserim, and says that it is a broad, well marked form, having

six teeth on the second joint of cheliceres and a very depressed* abdomen, and that it has been confounded with two, if not three, other species! Now I confess after having carefully looked over the references alluded to and Mr. Butler's notice, I have not succeeded in tracing Linné's *T. caudatus*, nor will, I think, anybody else do so; and if the species has been confounded by older writers, as no doubt it was, Mr. Butler has only added his share to that confusion.

Let us see whether and how far we might be justified to adopt the name *T. caudatus*.

Linné named a species in 'Syst. naturæ 619, n. 2' *Phalangium caudatum*, which he characterises as '*chelis ramosis, ano setifero*.' In Museum Lud. Reg., 1764, p. 426, the celebrated author describes the same species in detail and gives '*habitat in Java*,' quoting at the same time Seba's figures 7 and 8 on pl. 70 of his Thesaurus. To determine anything according to Seba's figures is an altogether hopeless case, but we know that Linné's description of *Ph. caudatum* was drawn up after a Javanese specimen, and we must, therefore, look to Java for Linné's *Ph. caudatum*. When we see through our literature we find, I think, only two descriptions and figures, which can bear out any comparison with Linné's type, and these are Lucas' *Th. caudatus* ex Java, and Koch's *Th. proscorpio* ex India orientali et Java.

In reading carefully over Linné's description, I think, the passages corpus.....ferrugineum,.....chelæ.....articulis 5 constructæ..... β (*i. e.* articulus tertius) subrotundus, inermis,... γ (*i. e.* art. quartus) subrotundus..... are decidedly more in favour of Lucas's than of Koch's figure. If we, therefore, wish to retain Linné's name we can reasonably, I believe, only adopt it in the form in which it had been introduced into science by Lucas in his Monograph of the genus in Guérin's Mag. de Zoologie for 1835. Any other meaning, which we force upon Linné's name, is more arbitrary than this, still I do not wish to leave altogether the references of previous authors to this name without notice.

I have already (p. 133) stated the reasons, which appear to me to indicate that Koch's reinstated *Th. proscorpio* of Latreille is distinct from Lucas' *Th. caudatus* of Linné.

Fabricius copied Linné. In Syst. entomologiæ, 1775, p. 441, he only added '*habitat in India orientali*,' and I do not think it improbable, that several specimens of *Thelyphoni* had been sent by the French and German Missionaries from South India to European Museums.

Pallas' two figures most probably refer to *Th. scabrinus*. He also had Indian specimens.

Latreille, both in his Hist. nat. des Crust., p. 180, pl. lx, fig. 4, and in his Gen. Crust., p. 180, evidently confounded various species from differ-

* Linné says: abdomen ovato-oblongum, supra et subtus gibbum.

ent parts of the world under one name. He does not give any descriptions.

The figure in Guérin's *Régne animale* would, if correct, represent a species distinct from *Th. Antillanus*, Koch, as already (p. 128) observed.

Douglas and M. Edwards' figure in their edition of the *Régne animale* most likely represents Koch's *T. proscorpio*.

I do not think it would be profitable to go further with this review, even if I had all the old books at hand. I have looked over many of these *historical* figures and descriptions, and if anybody wishes to study the history of the genus, he might do the same, but if he wishes to *determine his species*, he will find it much more profitable, to ignore every reference written prior to 1835, the date of Lucas' Monograph of the genus.

6. THELYPHONUS BEDDOMEI, n. sp. Pl. XII. Fig. 6.

Upper side of body granular, of cheliceres sparsely punctated; length of the five terminal joints of cheliceres equal to the first eight abdominal segments, these have on the upper side a median thin ridge; second joint of cheliceres with seven denticles on the upper edge; third joint on upper side shorter than the fourth, above and below with a spine; the length of one of the last limbs very nearly equals the total length of the body; a very fine short ridge in front of the lateral eyes; first lower abdominal segment enlarged, along the middle indistinctly grooved, with the posterior edge centrally much produced and rounded.

Hab.—Annamally mountains, South India.

The cephalothorax is much higher anteriorly than posteriorly, rounded in front, with the ocular tubercle prominent, smooth, its posterior portion being separated by a fine incomplete transverse groove from the intra-ocular one; central eyes of moderate size, dull yellowish; lateral eyes amber coloured, with a short, very thin and finely serrated ridge in front of them, disappearing already at the middle of the distance between the lateral and central eyes. Cephalic thorax granularly rugose, shining; thoracic portion conspicuously broader, more finely granular, dull. Cephalic groove deep, median thoracic and postocular pits and lateral groove well developed, smoothish, shining. Sternum elongately semi-elliptical. Abdomen rather broadly ovate and depressed, above granular, with very slightly raised posterior and lateral margins, the first eight segments with a central longitudinal fine ridge. Sides granularly scaly. Lower surface almost smooth, with sparse fine pits; first segment much larger than any of the others, depressedly convex, longitudinally indistinctly grooved, and with the central posterior edge considerably and rather narrowly and roundly produced.

First joint of cheliceres with the usual anterior process, provided with a rapidly attenuated sharp point. Second joint on the upper edge with seven denticles, of which the outermost is the smallest and the median on

the inner anterior corner the largest; below with two subequal denticles. Third joint with a distinct denticle on the upper and a slightly larger one on the lower side, the latter is accompanied by a minute sharp granule. These two joints are above and below rather densely punctated. The fourth joint is more swollen and larger than the third, with a depressed, anteriorly and posteriorly sharply serrated process, and a little spine on the median anterior lower edge. Fifth joint somewhat thinner than the previous, with a quite similar process than on the preceding joint, but slightly shorter, and also with a denticle on the lower side. Sixth joint, or movable claw, long, with the upper and lower inner edges serrated.

Tarsi of first pair of feet slightly shorter than the preceding metatarsus. All other feet with compressed, and on the upper side finely granular, femoral joints. Caudal seta slender, with rather elongated, hairy joints; its length equals that of the whole body.

Body including the seta, above, dark brown, on the cheliceres and on the cephalic portion of the thorax shining blackish brown; feet chesnut; lower side, deepest brown on the cheliceres and on the posterior end of the abdomen, dark brown on the first joint of cheliceres and on the anterior part of the abdomen, and lighter brown on the coxæ of the feet and on the sternum.

Total length,	40.5 m. m.
Length of the five terminal joints of cheliceres,	19 " "
" " cephalothorax,	14.5 " "
" " abdomen,	25. " "
" " first pair of feet,	42.5 " "
" " second, "	23.2 " "
" " third, "	25.5 " "
" " fourth, "	28. " "
" " caudal seta,	39.5 " "

The number and distribution of the denticles on the second joint of the cheliceres, the broad abdomen, the form of the first lower abdominal segment, and the slightly longer limbs distinguish the present species from the previous.

Explanation of plate XII.

Fig. 1. *Thelyph. scabrinus*, n. sp., p. 130; 1a, right chelicer, enlarged twice the nat. size; 1b, four anterior lower abdominal segments.

Fig. 2. *Thelyph. Assamensis*, Stol., p. 133, right chelicer, enlarged twice the nat. size; 2a, four anterior lower abdominal segments.

Fig. 3. *Thelyph. (conf.) angustus*, Lucas, p. 134; 3a, left chelicer enlarged three times the nat. size; 3b, four anterior lower abdominal segments, enlarged twice the nat. size.

Fig. 4. *Thelyph. formosus*, Butler, p. 137; 4a, right chelicer, and 4b, first four lower abdominal segments, both enlarged twice the nat. size.

Fig. 5. *Thelyph. indicus*, n. sp., p. 138; 5a, right chelicer, in twice the nat. size; 5b, four first lower abdominal segments.

Fig. 6. *Thelyph. Beddomei*, n. sp., p. 142; 6a, left chelicer, in twice the natural size; 6b, four first lower abdominal segments.

NOTE ON THE GENUS GYMNOPS, W. BLANF., (LACERTIDÆ),—
by W. T. BLANFORD, F. G. S., C. M. Z. S.

[Received 12th April, 1873.]

In the Journal of the Asiatic Society of Bengal for 1870, Vol. xxxix, Pt. II, p. 357, I proposed to distinguish a new and peculiar form of *Ophiops* from Chhatisgarh by the subgeneric title of *Gymnops*. The species, to which I applied the name of *Ophiops (Gymnops) microlepis*, differs from the typical forms of *Ophiops* found in India and Western Asia in its more elongate proportions, longer tail, single postnasal and minute dorsal scales.

Dr. Stoliczka has since obtained the same species in other parts of India and especially in Kachh (J. A. S. B. 1872, Vol. xli, Pt. II, p. 90 and Proc. A. S. B. 1872, p. 74), and he has adopted the name *Gymnops* as a generic term, founding the distinction from *Ophiops* mainly on the difference in the character of the dorsal scales, which are much smaller and more granular than in true *Ophiops*, although they are distinctly keeled and imbricate. Quite recently Proc. A. S. B., July 1872, p. 126, Dr. Stoliczka has described a second species *Gymnops meizolepis* from Kalabagh on the Indus. This has somewhat larger scales than *G. microlepis*, but it possesses the same elongate form, the tail from the anus being more than twice the length of the body, and it again presents the peculiarity of a single postnasal instead of two or three as in *Ophiops*.

But the name *Gymnops*, whether considered as generic or subgeneric, cannot be retained for this type of naked-eyed lizards, as it has been twice employed in ornithology, having first been applied by Spix to a South American genus of Raptores, for which, however, an earlier generic title viz., *Daptrius* existed, secondly by Cuvier to a Malayan genus of *Sturnidæ*, allied to *Eulabes*.

Under these circumstances I propose to change the name of the Indian lacertian genus, above specified, to *Chondrophlops* in reference to its somewhat granular scales.

ON *AQUILA BIFASCIATA* AND *AQUILA ORIENTALIS*,—
by W. E. BROOKS, C. E., ASSENSOLE.

[Received 8th April, 1873.]

I have long had in my possession two specimens of *Aquila orientalis*, Cab., one sent me by Dr. Bree and labelled by Mr. Gurney, and the other from Mr. Dresser. The latter is a *Sarepta* specimen from the Volga region, and the former, from the Dobrudscha.

On returning the Dobrudscha example, which Dr. Bree had submitted to Mr. Gurney, the latter sent the following memorandum.

"The eagle which I have ticketed '*Aquila orientalis*, Cab.' is identical with that so often sent in collections from *Sarepta* near the mouth of the Volga, and is in fact the only species of Eagle which I have seen from that locality. I have hitherto been in the habit of calling this eagle '*Aquila clanga* of Pallas,' but as Pallas does not appear, by the description of his *Aquila clanga* in the Zoog. Ross. As., Vol. I, p. 351, to distinguish between this eagle and the smaller spotted eagle *A. nœvia*, and as his measurements, which are given in old French feet, inches, and lines, (for a scale of which see Finsch and Hartlaub's *Vögel Ostafri.*) agree better with *A. nœvia* than with the present species, it will perhaps be best to adopt for the present species the name of *Aq. orientalis*, proposed by Cabanis in the *Journal für Orn.* 1854, p. 369, (note), which though not very well chosen is the next in order of priority and the earliest that can with certainty be applied to this eagle exclusively. The specimen now sent appears by its measurements to be a female, and is in adult plumage; the immature birds of this species being spotted in precisely the same manner as those of *Aquila nœvia* which is well shewn in Yarrell's figure of the 'Spotted Eagle.'"

I quote this memorandum by Mr. Gurney to shew upon what good authority one of my specimens is named *Aquila orientalis*, and the other, sent me by Mr. Dresser labelled *A. clanga*, *Sarepta*, closely resembles it.

Mr. Gurney's statement, that the immature is spotted like *Aquila nœvia*, is, as far as I can see at present, a mistake; for we have the bird in India (*A. bifasciata*) and it never in any way resembles *A. nœvia*.

I have, from the first, been struck by the great similarity of these two specimens to our Indian *Aquila bifasciata*, Gray and Hardwick; but had not till the other day obtained Indian specimens according in every respect, to a feather, with the European examples of *A. orientalis*, above referred to. Now I have, and the accordance is so beautifully perfect, that there is no

alternative, but to come to the conclusion that *A. orientalis* is identical in every respect with *A. bifasciata*.*

I have now, therefore, three European killed examples of *A. bifasciata*; the third being that sent me by Capt. Elwes, and referred to in "Stray Feathers," Vol. I, p. 291. The two first are in nearly mature plumage, and the third is quite mature; and is the finest specimen of the bird I have seen.

The two sent as "*A. orientalis*" have only slight indications of the nuchal patch; otherwise I should have recognized them at the first glance as *A. bifasciata*, as was the case with Capt. Elwes's Bosphorus bird. This term has, I believe, priority over *A. orientalis*, Cabanis, and if so will be retained for this eagle.

The application of Pallas's term "*A. clanga*" to the same species by some European writers is, I believe, an error, if I read the original description correctly. It appears to refer to our Indian spotted eagle which we accept as *Aq. navia*, and which I believe to be the true *navia*. Klein, whose work is dated 1750, is the author of the term *Aquila clanga*, and Pallas quotes and adopts this *synonym* in preference to the older term *Aquila navia*, Schwenckfield. This term Pallas also quotes under the head of *Aquila clanga*, but as a *synonym*. Schwenckfield's work is dated 1603.

In a letter received the other day from my friend Mr. Anderson, he records the occurrence of a lineated *A. Mogilnik* at Aden, which was stunned by flying against the telegraph wires there.

I may as well mention here that the Indian Imperial Eagle, to which I applied Hodgson's term of *A. crassipes*, is identical with the East European bird, *A. Mogilnik*, better known as *A. imperialis*, but the former is the prior term.

I compared our bird with an adult Turkish specimen sent me by Dr. Bree. Mr. Gurney also came to the same conclusion, after comparing the adult Indian birds, I had sent home, with European examples.

The West European Imperial Eagle is, however, quite distinct and is now known as *A. Adalberti*, Brehm. This is the species said to have no lineated stage, and having, when adult, an excess of white on the scapulars and ridge of wing.

* [Mr. V. Ball and I had the pleasure of comparing the two specimens of *A. orientalis*, referred to by Mr. Brooks, with a series of Indian *A. bifasciata*. They undoubtedly appear to be perfectly identical, both in structure and coloration. If the determination of those two specimens as *A. orientalis* is correct, (and upon such good authority, as Mr. Gurney, it ought to be), there can be no doubt that the two species must be considered as identical. F. Stoliczka.]

I sent a fine series of our Indian *Aquila hastata* to the Norwich Museum. Mr. Anderson also sent one example in mature plumage.

Besides these we sent others to ornithological friends. I hear from Messrs. Gurney and Dresser, that the adult plumage of this species is not to be distinguished from that of the small Pomeranian spotted Eagle which they term the true *Aquila navia*.

They assert, however, that though the adults are alike, the immature birds differ.

This is a point for further investigation, but the perfect accordance of the adults leads me to expect the same in the immature birds. The connection between the immature and the adult is the first point to be established, and this can only be done by the field naturalist.

One of my ornithological friends informs me that the immature of *A. orientalis* (which we have shewn is *A. bifasciata*), has spotted plumage like that of *A. navia*; another friend informs me he has received the immature bird, and it "is strangely like *A. bifasciata*!" Now the latter eagle is *not spotted*, and the "doctors," who are both men of repute, "differ."

These points will all be cleared up it is to be hoped before long; and we shall perhaps have the natural history of the Eagles as clear and as correct as that of the common Rook, with little or nothing else to be learned. At present the Eagles appear to be in a state of dire confusion, which the English naturalists are daily making worse.*

* Since the foregoing was written, Capt G. F. L. Marshall, who is much interested in this subject, came and examined the series used. He fully concurred in the identification of *A. orientalis* with *A. bifasciata*, and was even more positive than I was that the Danzig killed *Aquila hastata* was indeed that species. It will be remembered, it was sent to me labelled "*A. navia*." My English Ornithological friends with whom I communicated are incredulous regarding my identifications, and I, therefore, refer to my friend's corroboration. If all fails to convince them I shall have the series exhibited at a meeting of the Zool. Society.

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A CONTRIBUTION TOWARDS A MONOGRAPH OF THE INDIAN PASSALIDÆ,—
by DR. F. STOLICZKA.

[Received 27th April, read 7th May, 1873.]

Some years ago, when I visited my veteran friend Dr. J. J. Kaup in Darmstadt, I found him, quite unexpectedly, busily engaged with PASSALIDÆ. He urged me most strongly to collect Indian specimens, which I did; but the collection progressed so very slowly,—in spite of the very numerous applications which I made for assistance,—that Kaup's Monograph of the family appeared early in 1871* without my little contribution in the way of Indian materials.

When I saw that the geographical distribution of the PASSALIDÆ is so very peculiar and interesting for the study of our Indian fauna, I resolved to continue my researches, and to publish as far as possible a revised Monograph of all the Indian species, with such little additions to the anatomy and development, as might be obtainable. Of these points I shall, however, not speak on this occasion; they will be fully treated in my Monograph, which will be accompanied with all the necessary illustrations. I will merely mention that in India we meet with PASSALIDÆ in those districts only which have a Malayan fauna. No species is as yet known from the Himalayas west of Nipal, or from any part of Central India or the Panjáb.

The object of the few following lines is chiefly to give a list of the Indian species with authenticated localities, together with diagnoses of the new species which had lately come under my observation. I am sorry that I cannot complete more fully the task which I undertook, but in the middle of pre-

* Berliner Entomologische Zeitschrift, vol. xv.

parations for an expedition to Central Asia I am not allowed to do more, than to shew those who assisted me that their materials had been duly appreciated. My old friend Dr. C. Felder, the Lord-Mayor of Vienna, has sent me the whole of his collection of *PASSALIDÆ* for examination, and Dr. L. Redtenbacher, the Director of the Vienna Museum, sent me a great number of eastern species. These are rare instances of liberality and true interest in the work. My thanks are further due to Messrs. W. S. Atkinson and J. Wood-Mason, Messrs. Peal (Assam) and Mandelli (Darjeeling), Major H. H. Godwin-Austen, Major Beddome, Mr. Stahlknecht of Singapore, Mr. Theobald, Rev. Baker, Dr. Cameron, the late Dr. Walter Abbey and the late Capt. Mitchell of Madras. The original collection in our Museum contained only five of the commonest species.

In recording the species I will follow Kaup's last Monograph on the subject. Whatever opinion various naturalists may have regarding the mode of classification which that distinguished author has adopted, I do not think that they will find much fault with the limitation and characteristics of the genera* and species. Undoubtedly that Monograph is the most complete and the most remarkable paper which the philosophical school of naturalists has in late years produced. I am now not prepared to say anything for or against it, but I will do so in my Monograph, when I hope to have examined a larger number of *PASSALIDÆ*, than I had been able to do up to the present. Such mental productions† must not be disposed of with prejudice, they are entitled to receive a fair trial and a full share of all opinions *pro* and *con*, before we side one way or the other. Nobody will, after careful perusal, deny the fact, that Kaup's classificatory arrangement has in many respects very considerable advantages; it is easy and practical, but time and research must shew whether it can be adopted or not. Whenever I shall have any scruples against generic definitions, or against the quinquennial divisions, I shall state my reasons without any reference to the validity of the whole system.

Before proceeding to the details I have only to mention that I shall include in the present list all the species known to occur in the East Indies, *viz.*, India proper (Vorder-Indien), with Eastern Bengal, Burma, and the Malayan Peninsula as far south as Singapore (Hinter-Indien).

Sub-fam. AULACOCYCLINÆ.

1. *AULACOCYCLUS* PARRYI, Kaup.

I received numerous specimens from Malacca.

* Even in the very limited sense in which the author defines them.

† For a short exposition of the principles of the system, and a brief discussion thereon, see Proc. of the Society for May, 1873.

2. *CERACUPES AUSTENI*, n. sp.

This species possesses all the characteristics of the genus, as given by Kaup. Total length 22 m.m., width of head 4.8, of prothorax 6.6, of wings at the shoulders 6.8, length of elytra 12.3 m.m.

In general structure it is very like *C. fronticornis*, but the clypeus-horn is obtusely rounded at the end, not emarginated, the upper concave edge is punctated, longer and narrower than in that species. The processes on the jaws are posteriorly flattened and rugosely striated, anteriorly convex and smooth. The lateral scar of the prothorax forms a punctated S. Scutellum smooth, waist at the sides densely punctated.

The furrows of the wings are coarsely punctated, without any perceptible hair. The metasternum is convex, generally smooth, only along lateral margins finely punctated. The median tibiæ have externally two spines, the posterior ones only an indication of a small point.

Hab.—Naga hills, North Eastern districts of Bengal. Major H. H. Godwin-Austen found a couple of specimens at an elevation of 6000 feet.

I have never received *C. fronticornis* from any of these districts. It must come from the Chinese portion of eastern Tibet, for western Tibet has no forests.

3. *COMACUPES CYLINDRACEUS*, Perty.

Hab. Johore, at the southern end of the Malay Peninsula. One specimen measures: total length 26.4 m.m., width of clypeus 5.5, (Kaup gives 7 m.m.) width of prothorax 8, (Kaup gives 9), length of elytra 14.9 m.m., (Kaup gives 25½, which is clearly a mistake for 15.5 m.m.).

Kaup's specimens from Malacca appear to have had a much broader clypeus and prothorax, but the two Johore specimens which I examined agree with the description of the species in every other detail.

4. *COMACUPES MASONI*, n. sp.

Total length 30.5 m.m., width of clypeus 6.4, of prothorax, or shoulders, 9.1, length of elytra 16.75 m.m.

Resembles *C. basalis*, but is much more slender; upper lip with the front surface sloping, but scarcely indented at the edge; densely hairy. Clypeus densely punctated and shortly hairy, except in front of the horn, which is large, compressed, strongly projecting in front and very slightly elevated, with an obtuse end sharpened from below, its posterior end is almost vertical without a free point, the upper ridge is obtusely rounded, except for a short distance along the middle which is concave and rugose. Prothorax with the lateral scar small, smooth, with a little dot in front of it, as in *C. cylindraceus*, but in the present species the marginal furrow is in front near the corner almost angularly bent in. The furrows on the wings are slightly more coarsely punctated, than in the last species.

Scutellum and the waist at the sides and the whole of the lower side densely punctated and shortly hairy. Lower lip densely and coarsely punctated and hairy, with barely an indication of a central carina. The last four abdominal segments almost quite smooth. Middle and hind tibiae each with a strong spine.

Hab.—Johore, obtained by Mr. J. Wood-Mason.

Kaup quotes *C. cavicornis* from Malacca and Penang. I have not seen it, but there is a specimen of a *Comacupes* in Dr. Felder's collection, evidently belonging to a new species.* Its locality is given as Bras., which clearly means Brasilia, there is, however, no such form described from America, the specimen came much more likely somewhere from the Philippines.

5. *TÆNIOCERUS PYGMÆUS*, Kp.

Malacca. I have as yet obtained only a single specimen.

6. *TÆNIOCERUS BICANTHATUS*, Guér.

Johore, north of Singapore.

7. *TÆNIOCERUS BICUSPIS*, Kp.

Sikkim, Assam and Cachar hills. Common. Kaup also gives Malacca.

Sub-fam. ERIOCNEMINÆ.

First group. SOLENOCYCLEE.

8. *PLEURARIUS BRACHYPHYLLUS*, n. sp.

Total length 43, width of clypeus 9·8, of prothorax 12·5, length of elytra 14·2; total length varying from 41 to 44 m.m.

* *Comacupes Felderi*, n. sp. Total length 22·5, width of clypeus 5, width of prothorax 6·6, of shoulders 6·8, length of elytra 13·2 m.m. Upper lip in front and laterally deeply concave, as in *Aulac. teres*. Jaws with the upper of the three front teeth very small. Clypeus smooth, with a fine groove along the anterior straight margin. Horn situated far behind, as in *basalis*, rising almost vertically, slightly inclined forward, behind with a convex, smooth, simple and rounded edge; anteriorly below the point it is first vertically truncated, then concave, falling with a broad surface to the large forehead. Ocular ridge sharply angular in the middle, terminating with a small sharp point in the anterior corner of the clypeus.

Prothorax with a median groove, deepest about the centre, and a punctated, complete marginal furrow, only slightly bent in anteriorly; lateral scars small, sub-semilunar, deep, finely punctated. Wings in the furrows indistinctly punctated, not hairy. Scutellum smooth, waist at the sides finely punctated, below entirely smooth as is also the case with the metasternum and the abdominal segments. Tongue with a central carina and with the lower halves of the sides somewhat concave and roundly dilated. Lower lip smoothish in the middle, with a central impressed projection in the front edge; its lateral branches densely punctated. Tibiæ of the front feet very broad, each with six denticles; middle and hinder tibiæ stout, each with a sharp spine.

Jaws bidentate at the end; upper lip truncated in front, covered with red stiff hairs. Antennæ long, with only three short terminal lobes. Clypeus uneven, but not punctated; the central horn is flatly convex, smooth, transversely very elongately subtriangular, anteriorly with a small projection, ending in a small free point, from which diverge in a slight curve the frontal ridges, terminating with distinct tubercles near the front edge. This frontal edge has a sharp process above each of the two lateral margins of the upper lip, the left appears to be occasionally a little larger than the right one, recalling a similar structure in *Basilianus*. The two frontal tubercles are connected by a low ridge and the margin between them is deeply concave. Supraocular ridges with a sharp point above each eye, flattened in front, and externally at each corner terminating with a small spine.

Prothorax moderately convex, with a distinct central groove, but not extending anteriorly to the margin; marginal furrow narrow, finely punctated; lateral scar forming a shortly elongated and smooth impression.

Scutellum at base finely punctated and hairy, along each side of the centre finely strigated. Waist laterally densely punctated, below smooth, somewhat transversely rugose, but without any special scar.

Elytra with the shoulders somewhat swollen and projecting, smooth; all the furrows distinctly punctated.

Tongue long, with a median and two marginal ridges, strongly contracted in the lower half. Lower lip with its branches entirely punctated and hairy, slightly depressed in the middle.

Metasternum laterally densely punctated, but the posterior sloping corners are smooth, which is also the case with all the abdominal segments.

Prothorax at the lateral lower sides, and the median femora, covered with dense, long, rufous-brown hair; anterior femora, sides of metasternum and hinder tibiæ a little less hairy.

Hab.—Nilgheries and Malabar. I received originally two specimens of this species from the Madras Museum, but since then several others have been sent to me by Major Beddome and Rev. Baker.

Kaup describes a single species, *P. pilipes*, from Sumatra. The generic characteristics have to be slightly altered, but in all essential points the South Indian species agrees with *Pleurarius*.

9. SEMICYCLUS REDTENBACHERI, n. sp.

Total length 25·4, width of clypeus 5·2, of prothorax 7·3, of shoulders 7·1, length of elytra 14·3 m.m.

Jaws rather short, each with three denticles; antennæ moderately elongated, the three terminal lappets well developed and equal; upper lip squarish, hairy, very slightly concave at the front edge.

Clypeus rugose, punctated on the forehead, front edge very slightly emarginate in the centre, and with a small projection above the edges of the

upper lip. The horn originates in a slightly convex smooth tubercle, and extends freely and almost horizontally to near the front edge, its base is posteriorly and at the sides surrounded by a slight furrow, and from the point where the horn becomes free originates on either side a low, indistinct ridge, which makes a curve anteriorly and terminates in a small tubercle some distance short of the marginal projections. Supraocular ridges undulating, each with a sharp point above the eye and another at the anterior corner of the clypeus.

Prothorax convex, with a central groove; marginal furrow incomplete, punctated, terminating anteriorly, some distance from the central line, with an elongately ovate scar. Lateral scar large, slightly impressed, composed of a number of irregularly arranged, coarse pits; a few dots exist near the anterior corner.

Scutellum very finely punctated at the base; waist laterally densely punctated, below nearly smooth.

Elytra rather depressed above, but comparatively high; all the furrows coarsely pitted; each shoulder with a tuft of brown hair, which also extends a little posteriorly along the margin.

Tongue with three ridges, minutely punctated, tridentate at the front edge which is slightly narrower than the base. Lower lip transversely rather elongated, smooth, convex, with a rounded scar at each end; the lateral branches densely punctated. Metasternum on the posterior sloping corners coarsely punctated. Abdominal segments with an oblique furrow on either side, but in other respects nearly smooth.

Hab.—Ceylon. The only specimen examined is in the Vienna Museum; it was obtained by the late Mr. Zelebor during the Novara expedition.

The species almost perfectly agrees with the characteristic of the genus as given by Kaup.

Second group. LEPTAULACEÆ.

Out of the five genera distinguished by Kaup only one is represented in India, namely *Leptaulax*. It seems to be a little too closely allied to *Ciceronius*, and still more so to *Didimus*. From the last it is stated to differ by the single denticle in the centre of the front edge of the clypeus, while *Didimus* has two; but I have in a few instances also observed two denticles in both *Lept. bicolor* and *dentatus*. Of course we may say, what is in *Didimus* the rule, is an exception in *Leptaulax*, still it looks rather a little arbitrary to define genera in such cases. However, as I have not a single one of the species of *Didimus*, described by Kaup, for comparison, I do not wish to propose any changes in the genera, as characterized by him. Looking at *Leptaulax* in Kaup's sense, it seems to me somewhat doubtful that the number *five* will suffice to include all the different forms which must belong to the genus. The following details, taken with those of Kaup, may speak for themselves.

10. *LEPTAULAX DENTATUS*, Fabr.

The typical small form was obtained from Sikkim, Bútán, Assám, Tenasserim (at Mergui) and from Johore. In the Vienna collections it is represented from nearly all the Philippine islands.

The larger form, or *L. Timorensis*, is also very abundant in Sikkim (between 500 and 1000 feet), Bútán, Assám, Naga hills, Pegu (near Tonghú), and on the Andaman islands. It grows up to 37 m.m. I had very large numbers of both forms for comparison, and came to the conclusion that no definite characters exist by which the two species could be separated. I have all intermediate sizes from 21 to 37 m.m.

11. *LEPTAULAX BICOLOR*, Fabr.

Very common in Sikkim and through the whole of the Malayan Peninsula, as well as on the Andaman and Nicobar islands, in Malabar and in Ceylon. From the last locality two specimens exist in the Vienna Museum collection under the name of *Nietneri*, M. C.

A peculiar small variety, possessing cross bars in the lateral furrows of the elytra, instead of simple dots, occurs at Johore.

12. *LEPTAULAX PLANUS*, Illig.

This is, I think, a good species, the smallest of all our eastern *PASSALIDÆ*. It is very much more depressed, than either of the previous species, and in proportions and relative size of the prothorax and of the elytra it more closely resembles *dentatus* than *bicolor*, of which it is stated to be a synonym. Specimens from Java, Johore, and Malacca, whence I have lately obtained large numbers, measure between 13 and 14 m.m., but a somewhat larger variety occurs in Burma and on the Andaman islands. Specimens from these last localities measure 18 m.m., they are in almost every other respect identical with typical *planus*.*

Of the third group, the *ERIOCNEMINÆ*, no species as yet occurred within our limits. I received *Vellejus Moluccanus* from Amboina, *Eriocnemis monticulosus* from Sumatra, and gigantic specimens of *Erioc. tridens* from Java, but none from Siam or Malacca, which localities are also given by Kaup. The last species will have, therefore, to be included in our list.

*Fourth group. MACROLINÆ.*13. *MACROLINUS LATIPENNIS*, Perch.

Malacca; apparently rare.

14. *MACROLINUS WEBERI*, Kp.

Johore; a single specimen from Mr. J. Wood Mason.

* In Dr. Felder's collection I find a Malacca specimen named *pavilus*?

Dr. Redtenbacher (Coleopteren, Reise Oest. Fregatte Novara, 1867, p. 49) gives *Mastachilus politus** from Madras. There is a specimen of that species in the Vienna Museum collection, marked *Ind. or.*, and is most likely the one referred to by Redtenbacher. I very much doubt, however, that it is Indian. It was probably received from the Madras Museum, or from a collector, during the stay of the Novara at Madras. My reason for doubting the correctness of the Indian locality is based upon an observation which I made. I asked the Curator, the late Capt. Mitchell, for the loan of any specimens of *Passali*, he might have in the Madras Museum. I was promptly responded to, and shortly after received four specimens of *Passali*. Two proved to belong to a new species *Pleurarius brachyphyllus*, and the two others were *Solenocyclus exaratus* (known from Madagascar) and *Mastachilus polyphyllus* (from Australia).† After detailed inquiry Capt. Mitchell informed me, that the two first specimens (distinguished by numbers attached to them) were truly Indian, from the Nilgherries, but that the localities of the two others were unknown. They had been received from some old European collection. It seems to me very probable that something similar happened with the specimen of *M. politus*, obtained by the Novara at Madras.

Kaup describes *Macrolinus Waterhousei* and *Episphenus Moorei* from Ceylon. I have not seen either of these.

Fifth group. ACERALE.

Of the five genera, *Laches*, *Gonates*, *Aceraius*, *Cetejus*, and *Basilianus*, only the third and fifth have as yet been found in India; they are common and numerous, and the specific number of five will, I am sure, run short for what is in this case really required for specific determination, unless the genera are somewhat differently defined and grouped.

Of the other genera I have examined a few interesting species. Among these is one which Kaup would probably call the first, *moderately convex*, species of *Laches*, and the largest species of *Cetejus*; both answer exactly the characters of the respective genera. I add descriptions of the two new species‡ in a foot note.

* Originally described by Burmeister from Van Diemen's Land.

† The Vienna Museum possesses two specimens of *polyphyllus* from China.

‡ *LACHES GRACILIS*, n. sp. Total length 26, width of head 5.5, of prothorax 7.5, of shoulders 7.6, length of elytra 15 m.m. Whole body moderately convex.

Upper lip almost quite straight in front; left jaw barely longer than the right one. The three first lobes of the antennæ short, the fourth slightly shorter than the fifth. Clypeus on its posterior half rugosely punctated; the short horn rises from the anterior central edge of a transversely elongated, smooth protuberance; from it proceed under a narrow angle the frontal carinæ, each terminating in an elongated smooth tubercle, or rather short ridge, connected by a very fine carina. The marginal tubercles of the clypeus are pointed, depressed, placed nearer to each other than the width of the

A specimen of *Gonates naviculator* from the Moluccas, in Dr. Felder's collection, has the middle frontal carina very distinct, while two others of

upper lip, they are unequal, the left being slightly larger than the right one; they are not in any way connected with the frontal tubercles, but a smooth concave field proceeds from each of these to the respective ocular ridge. The latter is angular or sub-tubercular above each eye, and anteriorly formed by a thin carina, terminating on the angle of the clypeus with a little spine.

Prothorax somewhat broader posteriorly than anteriorly, with a very distinct central groove; marginal furrow very narrow, with a minute punctation; lateral scars vertical, subovate, punctated; a group of distinct dots also exists above each anterior corner.

Scutellum smooth; waist laterally punctated. All the furrows of the elytra coarsely punctated, without a trace of any kind of hair.

Tongue tricarinate, the middle carina the strongest; laterally slightly concave. Lower lip convex, smooth, with a transversely elongated, small, marginal, smooth scutellum between it and the tongue; branches coarsely punctated. Waist, below, with a small oblique, ovate scar on either side. Metasternum on the posterior part sparsely, on the sloping corners densely punctated. Abdominal rings each with a linear, punctated scar on either side. Prothorax, below, as well as the middle and hind tibiæ, sparsely covered with yellowish rufescent hair.

Hab.—Batchian island; a single specimen in the Vienna Museum.

CETEJUS AUSTRALIENSIS, n. sp.

Total length 33, width of head 7, of prothorax 9.9, of shoulders 9.6, length of elytra 19.2 m.m. Whole body rather depressed.

Left jaw slightly longer than the right one. Upper lip deeply emarginate, the right half being slightly shorter and a little more rounded than the left one, as in *G. naviculator*. Antennæ with six lappets, the two first being very short, the third a little shorter than the three terminal ones, which are subequal and rather slender. Clypeus entirely rugose; the horn is elongated, with a triangular tubercle on each of its basal halves. The frontal ridges issue from the horn under a moderately obtuse angle, (as in *Lept. dentatus*), and terminate with distinct points, connected by a very fine carina, from which the margin of the clypeus descends almost vertically. Both marginal tubercles are pointed, similarly formed, but the left one is conspicuously larger than the right. Each frontal tubercle is connected by a short carina with its corresponding marginal one, and besides also with its corresponding small tubercle in the middle of the supra-ocular ridge, each of which is truncated in front.

Prothorax slightly broader posteriorly than anteriorly, with a fine but almost complete central groove; sides entirely punctated, lateral scar small and rounded; marginal furrow very narrow.

Scutellum smooth, with a central basal groove; waist laterally punctated. The four central furrows of the elytra on the upper side indistinctly, the remainder distinctly, punctated, those at the sides at least twice as broad as the ridges separating them and with distinct transverse bacilli. This structure very strongly reminds one of *Basiliannus cancrus*, which is also the largest species of its genus.

Tongue tricarinate, laterally concave. Lower lip convex and smooth, with a small elongately semi-elliptical scutellum between it and the tongue; a small but distinct scar on each side of the lower lip, its branches rather larger, rounded at the ends and somewhat inwardly curved, entirely but not very densely punctated. Prosternal

the same species in the Vienna Museum collection from Amboina (marked *Doleschali*, M. C.) have merely a trace of the middle frontal carina, and the prothorax is comparatively smaller.

Gonates Germarii was received by Mr. W. S. Atkinson from Java. Kaup describes *Laches Comptonii* from Ceylon. I have not seen it.

15. *ACERAIUS GRANDIS*, Burm.

This is a very common species in Sikkim, Assam, the Naga and Cachar hills. Indian specimens exactly agree in structure with the large Javanese type form, but their usual size is only 40 m.m., and I never saw one exceeding 45 m.m. In Javanese specimens generally only the ninth and tenth rib of each wing are punctated and hairy near the shoulder, while Indian specimens have, as a rule, the whole of the seventh and ninth rib punctated; it is very rarely that the pits entirely disappear on the seventh.

16. *ACERAIUS EMARGINATUS*, Fabr.

An extremely variable species, both in general size, as well as in the shape of the two marginal processes of the clypeus; the left one being sometimes sharply pointed at the end, or scarcely bipartite, as in *Percheron's pilifer*. The seventh and ninth ribs of the elytra are as a rule entirely punctated, very rarely is the seventh smooth. The smaller forms, between 30 and 38 m.m., are, I think, mostly males, they have the furrows of the wings perceptibly punctated; the larger specimens, about and above 40 m.m., appear to be mostly females, the furrows of their elytra are almost devoid of punctations.

The species occurs in Sikkim, Assam, Cachar, but is much rarer than *A. grandis*. I also obtained it on Penang hill, and from Johore; in the Vienna collections are specimens from China, Luzon, and Manilla.

Redtenbacher's *Passalus Nicobaricus* from Sambelong (Great Nicobar) is also undoubtedly this species, and neither a *Macrolinus* nor a *Basilianus*.

The next genus, *Basilianus*, is the most numerous in species. I possess specimens of the four species described by Kaup, and three others which I must regard as new. This is as yet almost the only instance in which I have been obliged to transgress Kaup's limit of five species. I took considerable pains to ascertain whether these species could possibly belong to any of the other genera of *Eriocneminae*, but they do not answer to the characteristic of any

process between the anterior coxæ grooved. Waist, below, smooth, with an elongated scar on either side. Metasternum smooth; on the sloping corners rugosely punctated. Sides of abdominal segments and the posterior part of the last segment mostly finely punctated. No hairs are seen on the elytræ; the middle tibiæ are moderately hairy, the hind ones somewhat less so.

Habitat—Australia; a single specimen in Dr. C. Felder's collection.

other genus than *Basilianus*. They differ from *Aceraius* by the absence of hair at the sides of the elytra, and from the other genera of the *Aceraiæ* in the shape of the lower lip and the want of a scutellum between it and the tongue; the same character holds good in a comparison with *Mastachilus*, and the unequal lappets on each of the antennæ readily separate them from the other *Macrolinæ*. The seven species may, however, be divided into two sections, as follows:

a. With the marginal processes of the clypeus very asymmetrical,—*Nilgheriensis*, *inæqualis*, *Cantoris*, *Indicus*.

b. With the marginal processes of the clypeus very slightly or scarcely asymmetrical,—*cancrus*, *Andamanensis*, *Sikkimensis*.

17. *BASILIANUS NILGHERIENSIS*, Guér.

The usual size of Malabar specimens is only 28 m.m.; it does not appear to be a common species.

18. *BASILIANUS INÆQUALIS*, Burm.

Common at Malacca. Kaup gives it from Singapore and Penang. The largest specimen which I have examined is nearly 30 m.m., and the smallest 24·7 m.m., the length of the elytra being 13·7, width of head 5·5, of prothorax 6·9, the proportionate size of this last being often remarkably small.

19. *BASILIANUS CANTORIS*, Hope.

The usual size of Sikkim and Assam specimens is 33 to 35 m.m. Kaup gives it also from Malacca and Cambodia.

20. *BASILIANUS INDICUS*, n. sp.

Total length from 33 to 40 m.m., one specimen is 37·6, width of its head 9, of prothorax posteriorly 12, of shoulders 11·5, length of elytra 21·5 m.m.

Left jaw slightly straighter and longer than the right one. Upper lip widely and rather deeply emarginate in front. Antennæ, with the three terminal lappets longest and subequal, the second and third about half the length of the fourth, and the first is very short, sometimes scarcely traceable. Clypeus rather large, mostly smooth, or sparsely punctated, with the supra-ocular ridges anteriorly truncated with an inward slope, the inner edge of the slope being sometimes very indistinct, while the outer one is sharp, and projects at the corners, somewhat as in *Aceraius grandis*. The horn rises out of a transverse long tubercle, it is subpyramidal, the posterior slope being gradual, the anterior vertical; the frontal carinæ are very fine, forming together a wide semicircle, each terminating in a blunt tubercle, and from each proceeds a very fine carina to the respective marginal process of the clypeus; the left process is the longer, depressed, inwardly bent, obtuse at the end; the right one is thick, short, obtusely pointed.

The prothorax is moderately convex, as in *Cantoris*; it is conspicuously wider posteriorly than anteriorly, with a central groove which is almost as complete, as it is usually to be found in American forms and in these only; marginal furrow anteriorly somewhat widened, bent in and punctated; lateral scar small, rounded, generally with a few pits; the sides of the prothorax are either quite smooth (in the larger specimens), or punctated in front of the scar and at the anterior corner (in the smaller specimens). Whether this is a distinction of sex I cannot say.

Scutellum centrally very minutely strigated; waist laterally densely punctated. Shoulders slightly thickened, only anteriorly with few very short and thin hairs. Furrows of the elytra, above, slightly, laterally distinctly punctated; without hair.

Tongue tricarinate. Lower lip in the middle somewhat convex, mostly smooth or punctated, anteriorly sometimes slightly indented; its branches densely punctated, no scars exist on it. Waist, below, smooth, with elongated diverging, dull scars. Metasternum smooth, its posterior sloping corners rugosely punctated, its sides entirely hairy. Abdominal segments laterally with linear scars.

Prothorax posteriorly, below, covered with brown hair; middle tibiæ very densely, posterior ones less hairy.

Hab.—Nilgheries and Malabar. I received several specimens from Major Beddome, Rev. Baker, and Surgeon Major F. Day.

21. *BASILIANUS CANCRUS*, Perch.

The largest specimen in my collection is 45 m.m. It has as yet only been obtained in Nipál, Sikkim, Bútán, and Assám.

22. *BASILIANUS ANDAMANENSIS*, n. sp.

Total length 32 to 38 m.m.; one measures 35.6, width of its head 8, of prothorax 10, of shoulders 10.2, length of elytra 21 m.m.

Jaws almost equal. Upper lip straight in front or obliquely truncated, the left rounded corner being often a little more projecting. Lappets of the antennæ generally graduated, the first very short, the succeeding to the fifth gradually longer. Clypeus entirely punctated and covered with short hair; supra-ocular ridges low, distinctly truncated in front and with the carina round the concave space well developed. The horn consists of an elongated ridge, with a small tubercle on either side; it is slightly elevated at the anterior end and with an almost vertical slope. The frontal carinæ are rather short, terminating with elongated distinct points, connected by another carina, from which the margin of the clypeus is almost vertical. The marginal processes of the clypeus are far distant, situated above the edges of the upper lip; they are short, pointed, in some specimens apparently almost equal, in others the left one is distinctly larger. They exactly resemble those

of *cancrus*, and each also has on its lower side a small tubercle. From both the marginal processes and the frontal tubercles generally proceed a few irregular low ridges to the middle of each supra-ocular ridge.

Prothorax moderately convex, smooth, generally with a very faint indication of a central groove; lateral scar rounded and, like the entire lateral margins, very finely punctated; sometimes there are one or two dots at the anterior corner.

Scutellum smooth, convex, sometimes with a minute punctation along the lateral edges. Shoulders well prominent, and each with a group of short brown hair, considerably more developed than in *Cantoris*. Furrows of the elytra finely punctated; all the ridges smooth.

Tongue tricarinate. Lower lip large, mostly smooth, without any scars; its branches densely punctated. Prosternal carina sharp, long. Waist with elongated diverging scars, sometimes with a short, central, basal groove. Metasternum smooth, its hinder corners sparsely and very finely punctated; sides densely punctated and hairy. Abdominal segments smooth, with linear oblique scars. Middle and hind tibiæ rather thinly hairy; lower sides of prothorax more distinctly so; last abdominal segment at the end provided with conspicuously elongated brown hair.

Hab.—Andamans near Port Blair; Camorta and Katchal islands of the Nicobar group; common. I found one specimen in the Vienna collection, together with *Mastachilus politus*, labelled 'Madras,' 'Novara.' It was most likely obtained from some officer who had been at the Andamans, or from the Museum.

23. *BASILIANUS SIKKIMENSIS*, n. sp.

Total length 33, width of head 7.1, of prothorax or of shoulders 10, length of elytra 19 m.m.

This species resembles *B. Cantoris* in size and general character of form and convexity of the body. The jaws are subequal; the upper lip obliquely truncated, almost quite straight, with obtuse corners. The three first lappets of the antennæ much shorter than the three terminal ones, the two sets being among themselves almost equal. Clypeus entirely punctated and very similar to that of *B. Andamanensis*, but the horn is a little shorter, the frontal carinæ include a slightly smaller semilunar space, and the frontal processes of the clypeus are almost shorter, both pointed, nearly quite equal in size, and each is on the outer side accompanied by a short longitudinal carina, which, however, does not extend to the supra-ocular ridge.

Prothorax moderately convex, with a very faint trace of a median groove; lateral scar rather large, pitted all round, the dots or pits being almost continuous to the anterior corner and here again rather dense; along the lateral margins densely and very finely punctated.

Scutellum smooth. Shoulders moderately developed, on the anterior slope finely punctated and shortly hairy. Furrows of the elytra above distinctly punctated, laterally broader and with transverse bacilli, the seventh and eighth furrow are broadest.

Tongue rather narrow, punctated, thinly tricarinate, laterally concave. Lower lip convex, with sparse punctation, its branches densely punctated. Waist, below, with diverging elongated, dull scars. Metasternum smooth, its hinder corners coarsely punctated, and the narrow sloping sides along the elytra very finely punctated and hairy.

Abdominal segments with elongated, finely punctated lateral scars, broadest on the first few segments, linear on the penultimate and obsolete on the last. Lower side of prothorax the middle and hind tibiae with short and rather thinly distributed hairs.

Hab.—Sikkim. I obtained a single specimen at about 1500 feet, some two miles east of Pankabari.

The species is intermediate between *cancerus* and *Andamanensis*; with the latter it agrees in the shape and structure of the head, with the former in the transverse costulation of the lateral furrows of the elytra, but in *cancerus* this costulation is still stronger.

NOTE ON SOME ANDAMANESE AND NICOBARESE REPTILES, WITH THE DESCRIPTION OF THREE NEW SPECIES OF LIZARDS,—by DR. F. STOLICZKA.

[Received and read 7th May, 1873.]

I have given a list of the Reptiles and Amphibians, known from these islands, in a former paper,—Journal A. S. B., Vol. xxxix, pt. II, 1870, pp. 136-138 etc.; having, however, lately had an opportunity of visiting all the Nicobar islands (excluding Little Nicobar and Pulo Milu), and the Andamans, including the Cocos and Preparis, I am in a position to add a little information about some of the species. Our visit* was chiefly from an ornithological point of view, and as it fell already in the hot season (March), the time was very unfavorable for collecting reptiles, at least on the northern group of islands, which at this season are much drier than the southern Nicobars.

We found the following species generally distributed over nearly all the islands which we visited:—*Tropidonotus quincunciatus*, *Lycodon aulicus*, *Dendrophis pictus*,† *Cerberus rhynchops* and *Trimeresurus Cantoris*. Spe-

* In company with Mr. A. O. Hume, C. B., Messrs. Ball and Wood-Mason.

† In the July number of the Berlin Monatsbericht (for 1872, p. 583), just received, I observe that Dr. Peters describes a *Dendrophis terrificus*, with 13 rows of scales; it is very closely allied to *Dendrophis caudolineatus*, (compare ante p. 123), but differs in coloration.

cimens of *D. pictus* from the Nicobars generally are as soberly coloured as the continental form, while those from the Andamans are very much brighter, but the typical form again occurs on the Cocos.* The rare *Trimeresurus porphyraceus* was found to be common on the Preparis island; it grows to nearly four feet. Of lizards the most common were *Euprepes carinatus*, *Hinulia maculata*, *Cyrtodactylus rubidus*, *Tiaris subcristata* and *Hydrosaurus salvator*. Of Batrachians *Bufo melanostictus* is very common.

Euprepes macrotis, described by Steindachner, was observed in Galthea Bay on Great Nicobar (Sambelong).

The large Andaman form of *Euprepes carinatus*† is not specifically distinct from the common type. I met with similarly large specimens (up to 20 inches) on the Coco islands. Most of those which I obtained there have thirty rows of scales round the body, and each scale has seven keels, the three median ones being strong and distant from each other, the two laterals on either side short, thin and sometimes scarcely traceable. Some specimens have the anterior frontal in contact with the rostral as well as with the vertical, a short process of the anterior frontal separating the two posterior. The specimens were apparently in breeding dress. The whole sides of the head, neck and belly were vermilion or bright cinnabar red, the anterior extremities and the back were also strongly tinged with red. The entire sides of the body and of the tail and the extremities had numerous large, irregular white and black spots intermixed, giving the lizard quite a different appearance from the ordinary type. The white spots were most numerous along the edges of the back, but there is no marked white band present.

PHELSUMA ANDAMANENSE, Blyth.

Comp. Stoliczka in J. A. S. B., 1870, Vol. xxxix, pt. II, p. 162, and Anderson in P. Z. S. Lond. for 1871, p. 160.

The following is a complete description of this remarkable lizard.

Body rather stout, moderately depressed, tail tapering, narrow at the base, with transverse contractions at distances. Snout almost conically elongated, rostral broader than high, just reaching the upper surface of the head; nostrils lateral, in the hinder edge of an enlarged, somewhat swollen shield, followed by a slightly smaller one; on the upper side the two nasals are separated by two (rarely by three) shields. Head, body and limbs, above and at the sides, covered with equal granular scales, or rather shields,

* It is perhaps due to their more isolated situation that the Cocos and neighbouring islands, (Preparis, Narkondam, Barren island), have several Nicobar forms which on the Andamans are apparently wanting. We found *Carpophaga bicolor* common, *Calanus Nicobaricus* is said to have occurred on the Cocos, and *Megapodius* is found on Table island. Among shells I got numerous *Helicinæ*, exactly like *H. Dunkeri*, *Bulinus Nicobaricus*, var., *Cyclophorus*, like *C. nicobaricus*, &c.

† J. A. S. B., vol. xxxix, Pt. II., p. 170.

becoming on the tail more depressed, scale-like, and intermixed with a few larger ones. Eye of moderate size, with an almost round pupil; it is surrounded with small granules. Ear-opening ovately rounded, equal to about one third of the longer diameter of the eye. Eight to ten low upper labials. Lower rostral large, somewhat produced and contracted behind. Nine to ten lower labials, the first two are largest, not in contact, the succeeding gradually decrease in size. None of the chinshields are particularly enlarged, and they vary in arrangement in different specimens. The scales of the belly are roundly hexagonal, across the middle in twenty-one to twenty-three longitudinal, alternating series.

The adult male has thirty-one femoral pores, in an uninterrupted series, angularly ascending in the centre. The female has a similar row of enlarged but not perforated shields. Præanal shields not enlarged. A small slit exists on either side in the postanal margin. On the tail the subcaudals become a short distance from the anus enlarged, single, only occasionally broken up into smaller shields. The inner toes on both the fore- and hind-limbs are very short, almost rudimentary; the fourth toe is longest, and all have their front edges rounded.

The general colour in males is grass- or bluish-green, subject to very great changes during the life of the lizard; head and neck with yellowish orange spots and stripes, among which one from behind the eye, one or two across the occiput, and one along the middle of the neck are most conspicuous. The anterior part of the body is on the upper side marked with small, oval, orange spots, on the posterior part these spots are somewhat larger, encircled with yellow, and sometimes partly confluent. All these orange spots often assume during life a strong reddish tint. Tail generally uniform bluish green. The lower side is uniform yellow or yellowish white.

The females are more soberly coloured, particularly when not full grown, in which case the orange spots are much less distinct, and sometimes almost obsolete.

The lower sides of the toes, especially towards their terminations, are silvery grey.

The usual size of full grown males is five inches, head and body being two; specimens of six inches are great rarities. The females are generally somewhat smaller than the males.

The species is not uncommon about Port Blair. I found a few on old trunks of trees (between epiphytes) on Mt. Harriet. They generally hide themselves under the bark of trees, but also often feed on the ground. Mr. Wood-Mason about a year ago brought a large number of specimens from the vicinity of Port Blair. I have not seen specimens from any of the other islands.

GYMNODACTYLUS WICKSI, n. sp.

A small species, resembling in general character some of those described by Jerdon and Beddome from South India. The body is moderately slender and depressed, covered with very small, keeled tubercles which have the appearance of pointed granules; on the back there are numerous larger, but similarly formed, tubercles interspersed, and on the side of the belly these larger tubercles become distinctly spinulose; tail verticillate, with similar spinules, exactly as in *Hemidactylus frenatus*. On the snout the sharp granules are, as usually, somewhat larger than on the top of the head, but none are enlarged above the labials. The rostral reaches to the upper side of the snout, and is followed by two small shields, separated by a still smaller pentagonal azygos, the upper angle of which fits into a posterior emargination of the rostral. The nostril is lateral and directed somewhat backwards, it lies immediately behind the rostral, and is followed by two slightly enlarged and diverging shields, the anterior angles of which nearly touch the rostral, thus almost entirely isolating the nasal opening from the first labial and the shield behind the rostral. No particularly enlarged scales round the eye. Seven upper and lower labials, the first are in each case the longest, the succeeding gradually decrease in size, the last are very small; all are very low. Ear opening forms an oval, oblique slit, its distance from the eye is slightly less than that from the eye to the end of snout. Lower rostral large, obtusely pointed behind, followed on each side by a slightly enlarged shield, separated by smaller ones; there are no particularly enlarged chin-shields. The scales on the throat and anterior breast are finely keeled; those on the belly hexagonal and across the middle in about nineteen longitudinal series. Præ- or post-anals not enlarged. Sub-caudals along the middle line very little larger than the other shields covering the lower side. Reproduced portions of the tail are uniformly scaly, without enlarged tubercles.

The male has four præ-anal pores, situated between the femora in a shallow transverse depression, and quite separate from these are four or five femoral pores placed at the hinder lower edge of the femur, somewhat nearer to the hip than to the knee. Toes long and slender; basal portion with three or four transverse, squarish plates, the last the largest; terminal phalanges very much narrower.

Colour. Above, powdered brownish grey and white, a series of whitish, almost continuous spots along the middle of the back, extending on to the tail. There are six or seven of these spots from the nape to the base of the tail, and each of them is edged anteriorly and laterally with black, sometimes the lateral black edges develop into elongated spots and are most distinct. On the tail the white spots are less distinctly developed, but the transverse black margins well marked. The sides of the body, of the tail

and the upper side of the limbs is thinly checkered with black; the enlarged spinules and tubercles are all pure white. There is a dark streak between the snout and the eye, posteriorly there are three dark lines, one going to the occiput, the second to the ear, the third to the angle of the mouth; and generally there are one or two more below the eye, giving the side of the head quite an ornamental appearance. Labials spotted with white. Chin and throat powdered with brownish dusky, remainder of lower side uniform pale, more or less distinctly tinged with fleshy; in males more markedly so than in females. In the very young lizard (about one inch long) the lateral black spots along the back, and the median black line behind the eye are most distinctly marked, in other respects it does not differ from the adult.

Hab.—Preparis Island. I obtained five specimens, two apparently adult males and two females, and one young; all were found on the ground between old decaying vegetable matter. One of the largest specimens with perfect tail, measures: head and body 1.13, tail 1.37 = 2.5 inches. The length of the hind limb equals the distance from the shoulder to the groin.

I have great pleasure in connecting with this very interesting new species the name of the able Commander of the "Scotia," Capt. G. W. Wicks, who piloted us most skilfully through the labyrinth of small and large islands.

MOCOA MACROTYPANUM, n. sp.

Body moderately slender, head flattened above, muzzle rather attenuated and prolonged. Anterior frontal in contact with the rostral, separating the two elongated nasals, and posteriorly just touching the vertical, which is rather shortly, obtusely angular in front, and gradually attenuated behind. Four enlarged supraciliaries, preceded and followed by a smaller shield. The two anterior occipitals (? accidentally) united, the median one roundly angular in front, attenuated and contracted behind, the two laterals narrow, in contact with each other behind the median shield. Four pairs of scales behind the occipitals enlarged, occupying the whole width of the neck. Seven upper labials, the fifth under the orbit, six narrow lower labials. First chin-shield single, the second is a pair in contact, third separated by a small shield, fourth pair somewhat smaller. Lower eyelid with a transparent disk. Ear opening very large, rounded, with a perfectly smooth edge all round, the tympanum being distinctly visible. Body in the middle surrounded by twenty-two longitudinal series of smooth scales, six series being on the back; they are slightly larger than those at the sides. About fifty-two scales along the edge of the lower side, counted between the fore and hind limbs. A pair of moderately enlarged præ-anal shields. Median row of sub-caudals slightly enlarged. Limbs proportionately developed, with the toes very slender.

Head above brown, paler on the muzzle; three longitudinal white bands along the body,—one along the middle, originating between the eyes, and two along the sides, beginning on the supraciliary edges;—they are separated, above, by two somewhat broader brown bands, each being lighter coloured along the centre, and bounded at the sides by a similar brown band which is, however, darkest along the centre. The median dorsal white band becomes obsolete at the root of the tail, the two lateral ones continue on it, and unite when approaching the tip. Labials and sides of head brownish, spotted with white. Lower portion of the sides and the entire lower surface livid carneous, most distinctly so, and tinged with bright orange, on the lower belly and on the tail, which is also on the upper side carneous, with a few white dots at the side of the base, and irregularly marked with pale brown on the lower surface. Limbs, above, with very close longitudinal brown lines, toes all distinctly powdered with pure white.

Total length four inches, the head and body being 1·8, the length of the fore limb is equal to the distance between the shoulder and the angle of the mouth, or one-third of the distance between the axil and the groin; the length of the hind limb is one-half of the same distance.

Hab.—South Andaman. The single specimen was obtained on a sandy beach in Macpherson's Straits.

TIARIS HUMEL, n. sp.

A larger species than *T. subcristata*, and like this one with the crest interrupted above the shoulders, but the crest itself is very much more developed. The nuchal part is considerably higher than the dorsal one, on its convex edge it is composed of 13-15 lobes; the dorsal portion continues on to the tail, disappearing after about one-fourth of its length. None of the scales are at the lateral bases of the crest particularly enlarged. All scales on the body are distinctly and sharply keeled.

Head shelving and concave above; snout with a few enlarged scales along the centre; supraciliary edge sharp, its posterior end is separated by a short groove from a small tubercle following it. Two groups of enlarged conical scales on the upper side of the occiput; several (3-4) enlarged scales on the side of the head above the tympanum which is hardened near the centre, and about as large as the eye. Below the tympanum no scales are enlarged. Eight or nine upper labials and seven or eight lower labials; the scales adjoining the former are enlarged, and there is also a conspicuous row of slightly enlarged scales below the eye. A row of enlarged scales is separated from the lower labials by one of small scales. Scales on the side of the neck and body very small, arranged in somewhat irregular transverse series, with scattered larger ones intermixed; on the tail they gradually increase in size, but within a short distance of its base still have some

larger ones intermixed. On the limbs the scales are much larger, two or three on the upper side of the femora particularly so. Gular pouch and fold covered with small scales, which become larger on the lower belly than on its sides. The two rows of sub-caudals are slightly larger and more pointed than the shields on the upper side of the tail.

General coloration greenish olive, on the top of the head brownish; sides of the entire body more or less distinctly and rather densely reticulated and spotted with black and yellow; sides of head and neck and the gular sac tinged with purplish blue, labials spotted with blue. Chin mostly yellow; belly whitish, without spots. Tail brownish above, paler below, irregularly and indistinctly spotted with dusky.

Total length of one specimen 16 inches, of which head and body are 4·4 and the tail 11·6 inch. The fore limb when laid backwards extends beyond the groin, or almost to the præanal edge, and the hind limb when laid forwards fully reaches the anterior edge of the eye.

The above noticed characters readily separate the Nicobar species from *T. dilophus*, or *T. tuberculatus*, lately (P. Z. S. 1872, p. 533, pl. xxxviii) described by Dr. Günther from the East Indian Archipelago.

I obtained only two specimens (male and female) on the Nicobar island Tillingchang, but the species did not seem to be rare.

DIBAMUS NICOBARICUS, (Fitz.).

Rhinophidion nicobaricum, Fitz., Steindachner, Novara Rept. p. 52 and *Typhloscinus nicobaricus*, ibidem, p. 94.

I have two specimens for examination, one a male* and the other a female (known from dissection).

The male is six inches of which the tail is 0·9 inch; there are 24 longitudinal rows of scales round the body, and 48 transverse rows along the tail. The two extremities are on either side somewhat in front of the anus, towards which they converge; they are depressed, each lying in an oblique cavity, the intermediate space of the sacral region being flat, triangular and pointed above the anus. Each extremity is fully as long as the whole head,† it is covered on the upper side by three longitudinal rows of scales, narrowing towards the end which is occupied by a large, flat, nail-like scale.

The body of the female is somewhat stouter; it measures 5·5 inches, of which the tail is only 0·5 inch. The body is again surrounded by 24 longitudinal and the tail by 34 transverse rows of scales. On each side in front of the anus is an enlarged scale, separated by three small scales from the anal edge, and just in the place where the extremity in the male originates;

* This is in the Indian Museum and I am indebted to Dr. Anderson for the opportunity of examining it.

† In *D. Novæ-Guinææ* the extremity is only as long as the head is broad.

this large scale covers a small opening, in which internally a rather strong muscle terminates; the muscle is most probably emissible and retractile at the will of the animal.

All other characters are common to both sexes. The upper labial is separated from the rostral by a distinct groove. The shields are dark brown, almost blackish, with paler edges; paler below. The shields on the head are yellowish and there are occasionally yellowish spots on the chin and throat, or on the lower side of the tail.

As compared with *Typhloscincus Martensii*, Peters, the snout of the Nicobar species is narrower, the head posteriorly broader, the eyes, although covered by skin, distinctly traceable, all points to which Steindachner drew attention when comparing the two, but the shields of the head, the number of scales round the body and on the tail are in both species quite the same. There is in *T. Martensii* also an enlarged scale above the anal edge, but it is nearer to it than in the Nicobar species. Still, if it were not for Peters' distinct statement, that out of three specimens of *T. Martensii* two are males, and one a female, both without any trace of extremities, I should have considered the specific distinction of the *D. Nicobaricus* from *T. Martensii* somewhat doubtful. The coincidence is certainly remarkable.

Dibamus was characterized by Dumeril and Bibron (Erpet. gen. v. p. 833) from two New-Guinean specimens, sent to them by Prof. Schlegel. Both specimens were apparently males, but Schlegel* says that these only possess a pair of posterior extremities, the females having none. And this is strictly in accordance with the observation made on the two Nicobar specimens.

DESCRIPTIONS OF TWO NEW SPECIES OF INDIAN LANDSHELLS,
by DR. F. STOLICZKA.

[Received 7th May, 1873.]

The following descriptions have been drawn up with the view of supplementing the figures of them which are to be given by Mr. Theobald in the 'Conchologia Indica.' The first species is from the Shan-states, and was collected, several years ago, by Mr. Fedden; and the second was given to me by Mr. Foote who obtained it in the cotton soil district near Bolgaom, when on his geological tour.

* Comp. Berlin Akad. Monatsberichte for 1864, p. 271.

PLECTOPYLIS SHANENSIS, n. sp.

Pl. testa planorbulari, pallide fusca, apice minutissime exserto, pallido; anfractibus $6\frac{1}{2}$, angustis, sutura indistincte marginata junctis, primis $2\frac{1}{2}$ ad tribus minute rugulosis, cæteris transversim oblique striatis atque concentrice obsolete striolatis, ultimo ad peripheriam subrotundato, infrâ paululum angustiore, ad aperturam modice deflexo; umbilico spatioso, anfractus omnes suturâ distincte marginatâ separatos exhibente; apertura angulum circiter 55° attinentem cum axi formante, peristomate undique expansiusculo atque incrassato, margaritaceo lutescente, circumdata, ad utramque terminationem labii subangulati profunde incisa; labio plicis tribus distinctis instructo, plica mediana crassissima, ea atque infera multo tenuiore usque ad peristoma extensis, tertia interposita a margine remote evanescente, sed usque ad laminam internam verticalem, circiter tertiam partem unius circuitus a margine aperturali distantem, extensa; ultimo anfractu intus supra laminam verticalem antice plicis sex crassiusculis, postice plicis decem brevioribus atque tenuioribus instructo.

Diam. maj. 21.5, min. 17, alt. 6.5; diam. aut alt. aperturæ 7.5 m.m. Dimensiones speciminis secundi minoris sunt: 18.5, 15, 5.8, 6.6 m.m.

Hab.—Provinciam Burmanam 'Shan-states' dictam.

This *Plectopylis* is readily distinguished from its allies by the presence of three labial plicæ, the strongest being in the middle and extending, like the lower thin one, to the edge of the lip, while the intermediate one disappears before it reaches the aperture, but it is the only one which extends to the internal almost vertical lamina. This last is superseded anteriorly by six stronger and posteriorly by ten thinner and shorter folds, but there is no corresponding lamina present on the inner side of the last whorl.

In external shape and character of volution the species is almost identical with *P. reperculsa*, except that in this latter all the whorls are transversely striated on the upper side, and the last at the aperture a little more deflected, the umbilicus also appears to be a little wider, and not only the plicæ at the mouth but also the internal laminæ are totally different in *reperculsa*; in this one there are two internal laminæ on the inner lip one behind the other, and one on the outer lip projecting in the space bounded by the two others.

TRACHIA FOOTEI, n. sp.

Trach. testa albida, orbiculata, supra deplanata, infra inflata, versus medium angustata, perspective modice umbilicata, undique dense granulifera; anfractibus 4 ad 4.5, gradatim accrescentibus, primis duobus aut tribus convexiusculis, transversim striatis, cæteris magis deplanatis, transversim costulis inæqualibus et obliquis ornatis, ultimo ad peripheriam valde carinato, costulis in carina evanescentibus, ad aperturam valde descendente atque fere

omnino deflexo; basi circa umbilicum rotundate subangulata, similariter costulata, costulis usque ad peripheriam extensis; apertura fere horizontaliter deflexa, transversim rotundate elliptica, margine dilatato fere undique libero, ad angulum umbilici angustissime adnato, circumdata. Diam. maj. 13·3, d. min. 11·2, altitudo totius testæ 6; altitudo apert. cum peristomate 5·5, ejusdem latitudo 6·8 m.m.

Hab.—Belgaom, India occidentali.

The present species has to be placed in close proximity to *T. crassicostata*, and is as closely allied to it as this is to *T. fallaciosa*. It differs very markedly from *crassicostata* by its more distinctly orbicular and depressedly planorboid shape, by a well marked, smoother and thinner, peripheral keel on the last whorl, by a more inflated and towards the middle more contracted base, it being angular round the umbilicus, and by a considerably more deflected aperture.

In a former paper* I expressed a doubt about *H. fallaciosa*, *ruginosa*, and *nilghirica* belonging to the genus *Trachia*, as originally proposed by Albers. I observe, however, in well preserved specimens, that all of them possess the peculiar granular structure which is so characteristic of *Trachia*. *T. crassicostata* and *Footei* must now be added to the list of these closely allied Western Indian species.

ON RHOPALORHYNCHUS KRÖYERI, A NEW GENUS AND SPECIES OF PYCNOGONIDA,—by JAMES WOOD-MASON, of Queen's College, Oxford.

[Received and read May 7th, 1873.]

(With plate XIII.)

Much difference of opinion has prevailed with regard to the systematic position of the *Pycnogonida*, as to whether they should be classed with the Crustacea or with the Arachnida. By one set of naturalists, including Johnston, Milne-Edwards, Quatrefages, Kröyer, and Dana, they have been placed with the Crustacea; by another—including Latreille, Erichson, Gerstaecker and Huxley who separates them, as well as the Tardigrada and Pentastomida, from the typical Arachnida (Spiders, Mites and Ticks) as an aberrant order,—with the Arachnida. Dr. Anton Dohrn† who has recently studied the embryology of these animals finds that they are in no way related to the Arachnida, that they resemble the Crustacea in having a naupliiform first developmental stage, but that from this point the course of development ceases to exhibit anything in common with that of the Crustacea; under these circumstances I have thought it better to call the *cheli-*

* Journ. A. S. B., Vol. XL, Part II, p. 224.

† Jenaische Zeitschrift, 1869.

cerae, palps, and accessory legs (= mandibles, and 1st and 2nd pairs of maxillæ of Kröyer) of those who range the *Pycnogonida* with the Arachnida, *the first, second and third pairs of cephalic appendages* respectively, thus avoiding the use of terms implying affinities and homologies that may not in reality exist.

RHOPALORHYNCHUS,* gen. nov. Wood-Mason.

Corpus lineare, gracillimum, annulis thoracis perdistinctis, cylindricis, utrimque dilatatis, processibusque lateralibus magnis, obconicis. *Rostrum* uniarticulatum, elongatissimum (corporis longitudinem pæne æquans), clavatum, ore triradiato. *Annulus oculiger* in collum vix coarctatus. *Appendices cephalicæ primi paris* absunt. *App. ceph. secundi paris* tenuissimæ, rostro longiores, novemarticulatæ, articulis secundo tertioque elongatis; *app. ceph. tertii paris* paulo longiores, ex decem confectæ articulis,—quorum tertius quintusque sunt elongatissimi, terminalesque quatuor prehensiles ac margine interiori serrati ciliatique—in utroque adsunt sexu; appendices utriusque paris, secundi ad tertium, tertii ad quartum articulum, sunt geniculatæ. *Tuberculus oculiger* in postica annuli parte est situs. *Pedes* gracillimi, inermes, equales, corpore (rostro incluso) duplo longiores, unguibus auxiliaribus armati sunt nullis. *Abdomen* uniarticulatum, obtuse-conicum, perbreve, vix distinguendum.

RHOPALORHYNCHUS KRÖYERI, n. sp.

Body linear, smooth. The rostrum is almost as long as the rest of the body, moveably articulated to the middle of the anterior end of the oculigerous somite, slender and filiform nearly to its middle whence it expands and finally narrows to its obtuse extremity; when examined in profile, the convex upper contour of the expanded portion is seen to carry two minute forwardly-directed spines, the one behind the other in the middle line. The mouth is situated at the extremity of the rostrum and has the form of a triradiate slit, the three slits being so disposed that a circle described from the point in which they meet so as to pass through their free extremities would be by them divided into three equal sectors. The ocular tubercle is erect, occupies the posterior half of the segment on which it is placed, and has the form of a short cylinder surmounted by a minute cone, the eyes being situated partly on the cylinder and partly on the cone at points corresponding, as usual, to the extremities of the arms of a St. Andrew's cross. A very distinct crescentic suture, bounding the base of the ocular tubercle posteriorly and curving forwards and outwards so that, if produced far enough, it would pass

* ῥόπαλον, clava; ῥόγχος, rostrum.

out just in front of the first pair of legs, divides the oculigerous from the first thoracic somite.

The *cephalic appendages of the first pair* are absent. Those of the *second pair* are about $1\frac{3}{4}$ times as long as the rostrum with which they lie in the same horizontal line, being articulated one on each side of it to the anterior end of the oculigerous somite, are filiform, excessively slender, and composed of nine joints. The first joint is subglobular, being nearly as broad as long, much broader than any of the succeeding joints; the second greatly elongated and slightly expanded at the apex; the third is very short and slightly curved; the fourth is greatly elongated, but not so much so as the second; the fifth is shorter than either of the four equal terminal joints which, together with the fifth and the distal half of the fourth, are fringed with short and very delicate cilia. Those of the *third pair* are also extremely slender, are articulated, a little posteriorly and internally to the second pair, to minute processes springing from the ventral arc of the oculigerous somite and meeting in the middle line. They are composed of ten joints, of which the first is minute, the two next equal and cylindrical, the third greatly elongated and just perceptibly expanded at the apical end; the fourth short, scarcely longer than the second of the two basal joints, and curved; the fifth is likewise greatly elongated, but more expanded at the apex and longer than the third; the four terminal joints are short, slightly decrease in length from the first to the last which comes suddenly to a subacute incurved point forming a sort of claw, are curved, fringed on their inner and concave margins with cilia and minute spinules, and capable of being coiled tightly together so as to form a prehensile organ.

Both pairs of appendages are elbowed at a short joint, intercalated between two long ones, *viz.*, the second pair between the 2nd and 4th, the third between the 3rd and 5th joints.

In many other species the terminal joints of the third pair of cephalic appendages (*pedes accessorii*) will probably be found to be similarly modified as a prehensile organ; an examination of O. F. Müller's faithful figures of *Nymphon grossipes*, Fabr. in the *Zoologica Danica** would, in fact, alone suffice to show the existence of such a modification in that species, even if Kröyer† had not described it in his diagnoses of the genera *Nymphon* and *Zetes*, without, however, offering any interpretation of the structure.

The *oculigerous somite* has its anterior margin straight, and is but faintly constricted in front of the eye-tubercle.

The *first thoracic somite*, if its distinctness from the oculigerous somite be admitted, is very short. Of the remaining somites, the second and third are subequal, the former being if anything the longer; are as perfectly cylindrical,

* Op. cit., pl. cxix, figs. 5 et 8.

† Naturhist. Tidssk., 1844, pp. 108 et 116.

and nearly as long as, but slightly stouter than, the filiform proximal moiety of the rostrum; and are suddenly expanded at their articular ends, each somite presenting the appearance of a cylinder with a greatly truncated cone affixed by its truncated surface to each end. The fourth and last somite is scarce half the length of those that precede it, and is similarly expanded at its anterior end only. From the sides of the expansions at the posterior extremity of the 2nd and 3rd spring two somewhat inflated outwardly-directed, obconic processes which might, at first sight, be mistaken for the first of the basal joints of the legs from their close similarity to these, but which are in reality one with the somite from which they arise: precisely similar processes carry the legs both of the first and of the last somite in which, however, they diverge like the arms of the letter Y. Wedged in between the roots of these processes of the last somite and the posterior boundary of its ventral arc, lies a minute, obtusely-conical tubercle with a large circular (anal) aperture at its extremity. This is the abdomen, a very evident, though rudimentary, structure in most *Pycnogonida* and even biarticulate in one species (in *Zetes hispidus*, Kröyer), but here so reduced in size as to be quite invisible from above, and only demonstrable with difficulty from below whence it appears, in ordinary positions, under the microscope as a convex, ovoidal or heart-shaped plate. It, moreover, looks downwards and slightly backwards, instead of upwards and backwards or directly backwards as it usually does.

The legs are long, slender, simple, equal in length, rather more than twice as long as the body including the rostrum, and are composed of eight joints, terminated by a weak, slightly curved claw. Their three basal joints are as broad as long, equal, and almost globular; the fourth is club-shaped at the distal end; the fifth is all but as long as the fourth and, with the remaining joints, perfectly filiform; the sixth is shorter and about twice the length of the two last together; these are subequal.

Length of the body including the rostrum,	13 mm.
" " legs,	26 mm.
" " 2nd pair of cephalic appendages,	10 mm.
" " 3rd " " " "	12 mm.

From the linear form of the body and the slenderness of the legs, I conclude that my specimen is a male, a conclusion by no means invalidated by the presence of the third pair of cephalic appendages, which, being apparently invariably developed in both sexes throughout several genera, (*Nymphon*, etc.) consequently possesses no value in the determination of questions of sex.

Hab.—Dredged by the writer at Port Blair, Andaman Islands, in 25 fathoms of water, at which depth the bottom was clothed with a dense

tangle of delicate, filamentous algæ so closely resembling the animal in point of colour and form, that the latter was with difficulty distinguishable.

In conclusion, I dedicate the first species of *Pycnogonida* hitherto discovered in these seas to the memory of the illustrious Danish naturalist whose name is so indissolubly connected with the history both of the *Pycnogonida* and of the lower Crustacea.

Explanation of Plate XIII.

- Fig. 1. *Rhopalorhynchus Krøyeri*, nat. size.
 Fig. 2. The same greatly enlarged.
 Fig. 3. A cephalic appendage of the second pair, greatly enlarged.
 Fig. 4. " " " " third " "
 Fig. 5. Rostrum seen from the side " "
 a = mouth.

ALGÆ* COLLECTED BY MR. S. KURZ IN ARRACAN AND BRITISH BURMA,
 DETERMINED AND SYSTEMATICALLY ARRANGED by DR. G. ZELLER,
High Councillor of Finance in Stuttgart.

(Communicated by Mr. Kurz.)

[Received 3rd May; read 4th June, 1873.]

DIATOMACEÆ†

- *1. *PODOSIRA* KURZII, Z., n. sp.

Stipiti brevi cylindrico adnata; cellulis sphaericis, v. oblongis et diametro paulo longioribus; 1/175 ad 1/150 lin. crassis; 2 et pluribus isthmo brevi concatenatis, lævibus, valvulis ad commissuræ margines nodulis binis minutis instructis. Arracan, Akyab, in rupibus marinis submersis (3280, 3283.)

CHROOCOCCACEÆ.

- *2. *CHROOCOCCUS* MINOR, Ng. (*Protococcus minor*, Kg.).

Pegu, Elephant-point, in rhizophoretis ad corticem *Sonneratiæ apetalæ*. (3277).

* The arrangement is according to Rabenhorst's *Flora Europæa Algarum*, that of the sea weeds according to Kützing's *Species Algarum*. The numbers within brackets refer to Mr. Kurz's collections. Those species marked by an asterisk are new additions to Burmese phycology (see a paper on Burmese Algæ by the late Dr. G. von Martens, Journ. A. S. B., Vol. XL., 1872, p. 461 sq.)

† The diatoms from Burmah (about 60 or more species) are not yet distributed; Dr. L. Rabenhorst of Dresden has, however, been kind enough to undertake the determination of them. (S. Kurz.)

*3. *CHROOCOCCUS INDICUS*, Z., n. sp.

Strato gelatinoso, tenui, pallide fusco; cellulis singulis solitariis, oblongis v. globosis, 1/700—1/300 lin. crassis, virescentibus; tegumento hyalino, vix conspicuo, cytiodermate achromatico, cytoplasmate granuloso. In stagno silvatico ditionis Prome (3151).

*4. *CHROOCOCCUS GRANULOSUS*, Z., n. sp.

Strato gelatinoso, granuloso, aurantiaco; cellulis 4-12 et pluribus in familiis circiter 1/100 lin. crassas associatis, 1/500—1/300 lin. crassis, v. singulis ad 1/160 lin. crassis, globosis v. angulosis; tegumento tenerrimo, hyalino; cytiodermate hyalino, in cellulis junioribus vix conspicuo, in adultioribus crassiusculo; cytoplasmate aureo-fusco, rarius viridi. Pegu, in valli alluviali fluminis Irrawaddi versus Thabyægon, in rivulo exsiccato (3223).

*5. *APHANOCAPSA ALBIDA*, Z., n. sp.

Thallo tenui, membranaceo, amorpho, sordide albido; cellulis globosis, 1/700—1/600 lin. crassis, nunc solitariis, nunc seriatis aut acervatis; tegumentis diffluentibus; cytoplasmate homogæneo, pallide aerugineo. Arracan, Akyab, in stagnis salsis putrescentibus fluitans (3284).

*6. *SYNECHOCOCCUS FUSCUS*, Z., n. sp.

Cellulis singulis, interdum duabus v. tribus longitudinaliter seriatis ellipticis, utraque fine rotundatis, 1/100 lin. longis, 1/250 lin. crassis; cytoplasmate fusco v. lutescente, homogæneo. Pegu, in montibus Yomah dictis secus rivulum Thit-Kouk (Pazwoondoung) in limo arenoso (3258).

*LEPTOTHRICHEÆ.**7. *LEPTOTHRIX OCHRACEA*, Kg.

Pegu, in variis locis præsertim in montibus Yoma frequentissime e fissuris rupium humidarum protrudens et massas 1—1½ poll. crassas ochraceas formans. In collectione hæcce prostant stationes: Kadeng-choung ad Natmadhee (3232/a); Thayet-choung inter Kya-Eng (Eng = laculus) et Phounggyee, (3277); Wha-choung (choung = rivulus, fluvius, etc.) in stagno sylvatico (3237/a); Mui-how in montibus (Yomæ meridionalis) in fonte (3240).

*8. *HYPHEOTHRIX ÆRUGINEA*, Rabenh. (*Leptothrix*, Kg.).

Pegu, Phounggyee, ad ripas laculi in limo (3186/a) var. *subtorulosa*, Z. articulis ad genicula interdum parum contractis. Pegu, Kenbatee-choung in fonte ad vicum (3131).

*9. *HYPHEOTHRIX CALCICOLA*, Ag. b. *muralis* (*Leptothrix muralis*, Kg.).

Pegu, Henzadah, ad muros ædis cujusdam vetustæ lateritiæ. (3167).

- *10. *HYPHEOTHRIX SUBTILISSIMA*, Rabenh. (*Leptothrix*, Kg.).

Pegu, in muris humidis muscosis cisternæ in vico Tharawa, in vicinitate oppidi Henzadah (3214/a, 3223/a, 3223/b).

- *11. *HYPHEOTHRIX VIRIDULA*, Z., n. sp.

Strato tenui, membranaceo, obscure ærugineo-viridi; filis parum curvatis, dense intricatis, ad 1/750 lin. crassis, apicem versus attenuatis, ærugineis, obsolete articulatis, interdum torulosis; articulis diametro parum v. ad duplum longioribus; vaginis delicatissimis, arctis. Pegu, in palude prope Wanet, in limo et in plantis aquaticis. (3238).

OSCILLARIÆ.

- *12. *OSCILLARIA ANTILLARUM*, Kg.

Arracan, Akyab, in stagnis subsalsis. (3216).

- *13. *OSCILLARIA ANTLIARIA*, Juerg. a *physodes*. Ibidem (3216).

- *14. *OSCILLARIA BREVIS*, Kg.

Pegu, Kadeng-choung ad Natmadhee. (3134).

- *15. *OSCILLARIA CHALYBEA* Mert., var. *Indica*, Z.

Strato obscure chalybeo, filis tantummodo 1/400—1/375 lin. crassis. Pegu, in locis humidis limosis viæ inter Kyauzoo et Wachoung (3185).

- *16. *OSCILLARIA GRATELOUPII*, Bory.

Pegu, Elephant-point, in aquis dulcibus (3275).

- *17. *OSCILLARIA SANCTA*, Kg.

Pegu, Tharawa, non procul ab Henzada, in muris humidis cisternæ (3214/a, 3223).

- *18. *OSCILLARIA VIOLACEA*, Wallr. (*O. fenestralis*, Kg.)

Rangoon in limo aquæ dulcis. (3208).

- *19. *OSCILLARIA VIRIDULA*, Z., n. sp.

Strato membranaceo, viridi-ærugineo, longe radiante; filis læte ærugineis, rectis, 1/500—1/450 lin. crassis, apice ad dimidium attenuatis et leviter curvatis, subtilissime granulatis; articulis obsoletis, diametro duplo brevioribus. (*O. Neapolitanæ* proxima). Rangoon, in limo aquæ dulcis (3206).

- *20. *PHORMIDIUM ARENARIUM*, Rabenh. (*Ph. thinoderma*, Kg.).

Arracan, Akyab in limo aquæ subsalsæ (3220, 3286/a).

- *21. *PHORMIDIUM INUNDATUM*, Kg.

Pegu, Tharawa, prope Henzadah, in muris cisternæ (3223/b).

*22. *CHTHONOBLASTUS LYNGBYI*, Kg.

Arracan, Akyab, in rupibus marinis inundatis (3285).

*23. *CHTHONOBLASTUS BURMANICUS*, Z., n. sp.

Filis 1/1500 lin. crassis, ærugineis v. lutescentibus, indistincte articulatis, parum flexuosis, apice attenuatis, in fasciculos pallide fuscis, 1/300 lin. crassos, flexuosos, contortis; vaginis ad 1/100 lin. crassis, pellucidis, fibrillosis, margine undulatis. Pegu, Tharawa prope Henzadah, in muris cisternæ (3214b).

*24. *CHTHONOBLASTUS KURZII*, Z., n. sp.

Litoreus, strato nunc obscure chalybeo, nunc luteo-viridi, filamentoso; filis 1/400—1/300 lin. crassis, violascentibus, v. pallide ærugineis, numerosis, in fasciculos laxè contortis, apicibus attenuatis, obtusis; articulis plerumque obsoletis, diametro ad triplum brevioribus, rarius granulatis; vaginis 1/90—1/50 lin. crassis, sordidis, hyalinis, interdum transversim striatis. Pegu, Elephant-point, in rhizophoretis in limosis ad arborum radices et ad algas majores maritimas (3273, 3274).

*25. *LYNGBYA PALLIDA*, Z., n. sp.

Pallide viridis, adnata, filis 2-4 pollicaribus, cespitosis, flexuosis, luteis v. virescentibus, cum vagina lævi, achromatica, 1/60 lin., sine vagina 1/70 lin. crassis; articulis diametro 3-5plo brevioribus, subtilissime granulatis. Pegu in montibus Yomah, Wathabwot-choung in saxis arenosis submersis (3175).

*26. *HYDROCOLEUM MENEGHINIANUM*, Kg.

Pegu, Elephant-point, in rhizophoretis, ad radices et arborum truncos submersos. (3263).

*27. *HYDROCOLEUM STRIATUM*, Z., n. sp.

Rivulare, semipollicare, ærugineo-nigrum; vaginis 1/90 lin. crassis, transversim striatis, striis in 1/100 lin. 9; filis inclusis plerumque ternis, leviter contortis, 1/180 lin. crassis, dense granulatis, continuis, vel obsolete articulatis; diametro multo brevioribus. Pegu, in rivulo vadoso prope San-yæ-wa ditionis Rangoon (3200).

*28. *SIROCOLEUM INDICUM*, Z., n. sp.

Cespitè parvulo, vix semiunciali, viridi; vaginis a basi 1/60 lin. crassa ad 1/250 lin. attenuatis, achromaticis; filis initio pulchre ærugineis, apice obtusis, obsolete articulatis, articulis diametro æqualibus, 1/750 lin. crassis, deinde pallidioribus et divisione longitudinali et transversali in gonidia 1/1500 lin. crassa, seriata, diametro 2-4plo longiora, collapsis. (*Sirocoleo*

Gujanensi affine, sed multo tenuius. Genus accuratius observandum). Arracan, Akyab, in rupibus maritimis inundatis (3280).

*29. *SYMPLOCA KURZIANA*, Z., n. sp.

Lignicola, pollicaris et ultra, griseo-æruginea, fasciculis strictis, densis, basi coalitis: filis rectis, pallide ærugineis, subtiliter granulatis, continuis vix hinc inde obsolete articulatis, cum vagina $1/375$ lin. crassis; vaginis achromaticis, aretis, superne sæpe vacuis. Pegu, in fundo naviculæ fluminis Myitnan ad Thabyægon (3222).

*30. *SYMPLOCA LUTESCENS*, Z., n. sp.

Lignicola, semipollicaris, vix ultra, fasciculis basi viridi-ærugineis, apicem versus lutescentibus, dense cæspitosis; filis pallide ærugineis, apice evaginatiss, granulatis, sine vagina $1/450$ — $1/300$ lin. crassis; articulis obsoletis; vaginis rigidis, achromaticis, ad $1/175$ lin. crassis. Pegu, in planitie alluviali fluminis Irrawaddi, in fundo naviculæ, qua fluvium Lhein prope Beendau-Hseat transiit cl. Kurz (3160).

NOSTOCHEÆ.

*31. *NOSTOC ELLIPSOSPORUM*, Rabenh. (*Hormosiphon*, Desmaz.) var. vaginis achromaticis.

Prome, in montibus Yomæ, inter muscos secus declivia rivuli Whay-dho (3178).

*32. *NOSTOC GRANULARE*, Rabenh. (*Hormosiphon*, Kg.).

Pegu, Elephant-point, in aquis dulcibus stagnantibus (3291).

*33. *NOSTOC PURPURASCENS*, Kg. (*N. rufescens*, Ag., forma purpurascens). Pegu, Kadeng-choung ad Natmadhee, natans (3230).

*34. *NOSTOC RIVULARE*, Kg.

Pegu in montibus Yomæ, Koon-choung ad saxa arenosa humida (3176).

*35. *NOSTOC HETEROTHRIX*, Z., n. sp.

Strato irregulariter expanso, olivaceo-viridi; filis leviter flexuosis, inæqualibus; alteris ærugineis, articulis globosis, $1/600$ — $1/450$ lin. crassis, cytiodermate vix conspicuo hyalino; alteris fuscis, cytiodermate evidenti, colorato, articulis globosis v. ellipticis, ad $1/175$ lin. crassis; cellulis perdurantibus ellipticis, ceteris paulo majoribus. (Forsan *Hormosiphon heterothrix*, Kg.?) Pegu, in valli Pazwoondoung, in rivulo Bala-choung (3196); secus declivia limosa fluminis Irrawaddi ad Khyoung-gyee (3163).

*36. *NOSTOC KURZIANUM*, Z., n. sp.

Terrestre, thallo fusco-atro, irregulariter expanso, membranaceo; filis densis, parum curvatis, fulvis; articulis $1/600$ — $1/500$ lin. crassis, sphaericis,

arctis, virescentibus; peridermate tenui, hyalino; cellulis perdurantibus globosis, ad 1/400 lin. crassis. Pegu, in montibus Yomæ centralis, Whathabwot-choung ad declivia limosa (4138).

*38. *NOSTOC LIMOSUM*, Z., n. sp.

Terrestre, thallo olivaceo-fusco, tenui, indefinite expanso; filis brevibus rectis, dense implicatis, filis leptothrichoideis tenerrimis, articulatis, hyalinis intermixtis; articulis 1/500—1/300 lin. crassis, auctis, globosis v. ellipticis, arcte connexis, granulis viridibus fartis; peridermate hyalino, achromatico; cellulis perdurantibus sphaericis, duplo majoribus. Pegu, in planitie fluminis Irrawaddi, in limo ripario fluvii Lein inter Theo-choung et Beendau Hseat (3157).

*39. *NOSTOC SAXATILE*, Z., n. sp.

Subglobosum, vetustate intus cavum, magnitudine cerasi, olivaceo-fuscum, aggregatum; peridermate fuscescente, filis non vaginatis, flexuosis; articulis ellipticis, pallide ærugineis, subtiliter granulatis, 1/600—1/500 lin. crassis; cellulis perdurantibus globosis, ad 1/375 lin. crassis. Pegu, in montibus Yomæ centralis, Kayeng-mathay-choung in saxis arenosis humidis (3180).

SPERMOSIREÆ.

*40. *ANABÆNA BULLOSA*, Kg.

Pegu, in valli fluminis Sittang, in laculo prope Otwang, Tounghoo (3150); Pegu, in planitie fluvii Pazwoondoung, Bala-choung in limo (3241/6).

*41. *ANABÆNA FLOS-AQUÆ*, Kg.

Pegu, in fluvio Lhein inter Beendau-Hseat et Theong-choung (3159).

*42. *ANABÆNA STAGNALIS*, Kg.

Pegu, in fluvio Lhein prope Beendau-Eng (3161/6); Khyoung-gyee ad ripas fluminis Irrawaddi (3164).

*43. *ANABÆNA SUBTILISSIMA*, Kg.

Rangoon, in limo canalium æstuariarum (3205).

*44. *ANABÆNA INDICA*, Z., n. sp.

Strato tenui, expanso, obscure viridi, deinde fusco; filis rectiusculis, densis, subvaginatis, ærugineis, denique fuscis, apicem versus attenuatis; articulis tenuioribus 1/650 ad 1/600 lin. crassis, sphaericis, sæpe geminatis; crassioribus (sporangii) ad 1/350 lin. crassis, sphaericis, v. ellipticis; cytioplasmate dilute ærugineo, granuloso. Arracan, Akyab, in limo aquæ subsalsæ (3213, 3218); Pegu, in montibus Yomæ, Yaitho-choung, in arena humida rivuli frequens (3234).

*45. *CYLINDROSPERMUM HUMICOLA*, Kg.

Pegu, in limo ripario fluminis Irrawaddi ad Khyoung-gyee (3165).

*46. *CYLINDROSPERMUM MACROSPORUM*, Kg.

Pegu, Kadeng-choung ad Natmadhee, natans (3230).

*RIVULARIÆ.**47. *GLOIOTRICHIA KURZIANA*, Z., n. sp.

Thallo globoso, lineam crasso, obscure olivaceo; filis ærugineis, brevibus, subulatis; articulis sæpe confluentibus, inferioribus ad 1/300 lin. crassis, diametro duplo brevioribus, superioribus eam æquantibus; vaginis ad 1/150 lin. crassis, achromaticis, sporis ærugineis v. lutescentibus, ovatis, basi ventricosis, ad 1/180 lin. crassis, diametro 2-4plo longioribus, dense granulatis; cellulis perdurantibus sphaericis, 1/250 lin. crassis.—Arracan, Akyab in plantis aquæ dulcis (3212).

*48. *RIVULARIA PEGUANA*, Z., n. sp.

Thallo gelatinoso, indefinite expanso, olivaceo, molli, hyalino; filis incluis ærugineis, basi 1/300 superne 1/500 lin. crassis, apice plus minusve acuminatis, laxè intricatis, flexuosis, nunc distincte articulatis, articulis v. moniliformibus, diametro æqualibus v. duplo longioribus; nunc—præsertim in parte superiore,—continuis; cellulis basilaribus globosis, 1/300—1/175 lin. crassis, denique in sporangia fusca permutatis.—Pegu, Kadeng-choung ad Natmadhee in truncis vetustis submersis (3228).

*MASTIGOTHRICHÆ.**49. *MASTIGOTHRIX ÆRUGINEA*, Kg.

Pegu, Yenay Eng, in planitie alluviali fluminis Irrawaddi, ramis emortuis insidens (3132).

*50. *SCHIZOSIPHON PARIETINUS*, Næg.

Arracan, Akyab in parietibus Phari vetusti (3215).

*SCYTONEMACEÆ.**51. *SCYTONEMA AUREUM*, Menegh.

Pegu, in variis locis frequens, ad rupes et corticola.—Elephant-point (3276); inter Rangoon et San-yæ-wa (3352); in montibus Yomæ centralis, Kayeng-mathay-choung, ad saxa arenosa (3173).

*52. *SCYTONEMA CINEREUM*, Menegh.

Pegu, in templis pagoda dictis vetustis fere undique; Kya Eng in templo vetusto (3199).

var. b. *Julianum*, Rabenh. (*Drilosiphon Julianus*, Kg.). Pegu, in montibus Yomæ centralis, Yay-gna-choung ad saxa arenosa (3236).

*53. *SCYTONEMA GRACILE*, Kg.

Pegu, in planitie fl. Irrawaddi, Palay Kweng in cisternæ muris (3224).

*54. *SCYTONEMA TOMENTOSUM*, Kg.

Supra Rangoon, corticola (3466).

*55. *SCYTONEMA PEGUANUM*, Martens.

Pegu, in valle Sittang (3139); Phoung-gyee (3118), in truncis arborum frequens.

*56. *SCYTONEMA VARIUM*, Kg.

Pegu, in montibus Yomæ, in valle Choung-menah (Khaboung) (3152); Wachoung (Pazwoondoung) (3241/0).

*57. *SCYTONEMA VIEILLARDI*, Mart.

Arracan, Akyab, in stagnis exsiccatis subsalsis (3287).

*58. *SCYTONEMA FULVUM*, Z., n. sp.

Strato obscure olivaceo; filis curvatis, 1/180—1/120 lin. cum vagina crassis, fulvis; pseudoramulis sparsis, divaricatis, conformibus; apicibus attenuatis, clausis, extremis hyalinis; filis internis vix conspicuis, pallide virescentibus; articulis obsoletis; vaginis lævibus, arctis, aureo-fulvis.—Pegu, Rangoon in foliis calami (3467); Yoma in cortice arborum (3146).

*59. *SCYTONEMA FUSCUM*, Z., n. sp.

Strato pannoso, fusco-rubescens; filis 2-3 lin. altis, subsimplicibus, gracilibus, elongatis, basi 1/180—1/120 lin. cum vagina, superne 1/200 lin. cum vagina, 1/300—1/250 lin. sine vagina crassis; vaginis lævibus, saturate fuscis, apicem versus pallidioribus; filis inclusis pallide virescentibus, obsolete articulatis, granulatis, articulis diametro æqualibus.—Pegu, in terra nuda et ad declivia argillosa, Sanyæ-wa prope Rangoon in oryzetis (3201); in montibus Yomæ in valle fluvii Choung-menah (3153); Wachoung, in via cava (3187).

*60. *SCYTONEMA KURZIANUM*, Z., n. sp.

Strato olivaceo; cæspitulis vix lineam altis, compactis; filis 1/300 lin. cum vagina 1/450 lin. sine vagina crassis, subsimplicibus, basi coalescentibus curvatis, internis articulatis, viridi-lutescentibus; articulis sæpe obsoletis, diametro æqualibus; vaginis achromaticis v. lutescentibus; cellulis perdurantibus globosis.—Pegu, Yoma, in cortice arborum (3141/a).

*61. *SCYTONEMA MURALE*, Z., n. sp.

Strato compacto, spongioso, lineam crasso, sordide olivaceo, v. nigrescente; filis intricatis, flexuosis, parce ramosis; pseudoramulis conformibus, brevibus, cum vagina 1/300—1/200 lin. crassis, luteis, apice cinereis, inter-

dum roseolis ; filis internis $1/350$ — $1/300$ lin. crassis, pallide viridibus, apice hyalinis, distincte articulatis ; articulis diametro æqualibus, v. duplo brevioribus ; vaginis subachrois, arctis ; cellulis perdurantibus globosis.—Rangoon ad muros hospitii circuit-house dicti (3207, 3209).

*62. SCYTONEMA OLIVACEUM, Z., n. sp.

Strato cespitoso, 2-3 lin. alto, olivaceo ; filis leviter flexuosis, rigidis, cum vagina $1/150$ — $1/115$ lin. crassis ; internis $1/180$ lin. crassis, cinereis, distincte articulatis ; articulis lamellosis, v. granulosis et linea transversali dimidiatis, diametro parum, hinc inde $2\frac{1}{2}$ plo brevioribus ; pseudoramulis, divaricatis, sæpe geminis, non tenuioribus ; vaginis fuscis, lævibus. Pegu, in montibus Yomæ centralis, Zamayee-choung, in fissuris humidis rupium arenosarum (3235).

*63. SCYTONEMA PARVULUM, Z., n. sp.

Strato tenui, tomentoso, fuscescente ; filis brevibus, subsimplicibus, attenuatis, basi $1/375$ lin. superne $1/500$ lin. cum vagina vix $1/700$ lin. sine vagina crassis, a basi distincte articulatis ; articulis diametro æqualibus, vel longioribus, superne confluentibus ; vaginis fuscis, filis internis viridibus. Pegu, in saxis arenosis montium Yomæ australis (3156).

*64. SCYTONEMA (SYMPHYOSIPHON) RHIZOPHORE, Z., n. sp.

Cespitulis obscure olivaceis (in siccatis cinereo-nigrescentibus), spongioso-hirtis, semilineam crassis ; filis fasciculatis, flexuosis, fuscis, parce pseudoramosis, cum vagina $1/300$ — $1/225$ lin. crassis, apicem versus attenuatis, internis pallide ærugineis ; articulis diametro æqualibus, vel ad triplum brevioribus, sæpe obsoletis ; vaginis arctis, basi et apice brevi, acuminato, hyalinis ; cellulis perdurantibus oblongis. Pegu, Elephant-point, in rhizophoretis ad cortices arborum diversarum, imprimis *Sonneratiæ apetalæ* (3267).

*65. SCYTONEMA SUBCLAVATUM, Z., n. sp.

Calicicola ; strato obscure olivaceo, filis fuscis, sæpe basi connatis, partim (junioribus ?) sursum incrassatis, $1/30$ — $1/20$ lin. longis, simplicibus, curvatis, ad $1/180$ lin. crassis ; partim elongatis, ramello uno alterove instructis, $1/300$ lin. cum vagina crassis ; filis internis virescentibus, nunc obsolete, nunc distincte articulatis ; articulis diametro æqualibus ; vaginis arctis. (Forsan status *Scytonematis muralis*). Pegu, in domo vetusta lateritia opidi Henzadah (3167, 3168, 3169).

*66. SCYTONEMA VIOLASCENS, Z., n. sp.

Cespitè erecto, 3-4 lin. alto, pallide violaceo ; filis basi $1/150$ — $1/100$ lin. cum vagina $1/130$ — $1/110$ lin. sine vagina crassis, fasciculatis, parce ramosis ; pseudoramulis interdum binis, adpressis, vel intricatis, elongatis, gracilibus, flagelliformibus, variegatis, violaceis, ærugineis et fusco-luteis, ad $1/250$ lin.

attenuatis, apice pallidioribus vel hyalinis; articulis diametro ad duplo brevioribus, sæpe confluentibus; vaginis arctis, hirtis, hyalinis v. lutescentibus. Pegu, Yoma in valle Choungmenah (Khaboung) ad declivia argillosa (3154).

*67. *POLYPOTHRIX BINATA*, Z., n. sp.

Lacustris, cæspitulis 2-3 lin. altis, ærugineo viridibus; filis pulchre ærugineis, primariis 1/300 lin. crassis, pseudoramulis divaricatis, elongatis, 1/500 lin. crassis; articulis inferioribus distinctis, sæpe dimidiatis, plerumque diametro duplo longioribus, rarius ei æqualibus v. brevioribus, subtorulosis, supremis confluentibus. (Articuli sæpe ad modum *Sirosiphonis* longitudinaliter bipartiti). Pegu, Kya Eng, in radicibus submersis (3195, 3203) Eng-ga-na (3242, 3248).

SIROSIPHONACEÆ.

*68. *SIROSIPHON PARASITICUS*, Z., n. sp.

Strato cespitoso, fusco; filis virescentibus, 1/200 lin. cum vagina 1/300 sine vagina crassis, curvatis, parce ramosis; ramis ascendentibus, homogeneis; articulis sæpe obsoletis, vel confluentibus, duplici serie ordinatis, granulosis, diametro brevioribus; vaginis arctis, luteis v. hyalinis. Pegu, Yoma, Choungmenah, in sylvis sempervirentibus ad folia arborum et fruticum (3292).

PALMELLACEÆ.

*69. *PLEUROCOCCLUS VULGARIS*, Menegh. (*Protococcus*, Kg.).
Rangoon, ad parietes hospitii circuit house dicti (3210).

*DESMIDIEÆ.**

*70. *CLOSTERIUM STRIOLATUM*, Ehrenb.

Pegu, Kya Eng, inter plantas submersas aquaticas.

*71. *PLEUROTENIUM BACULUM*, De Bary (*Docidium*, Bréb.).

Pegu, in palude prope Wanet, natans (3238/a).

*72. *PLEUROTENIUM TRABECULA*, Næg. (*Docidium Ehrenbergii*, Bréb.).

Pegu, Eng-ga-na prope Phounggyee (3242).

*73. *EUASTRUM ANSATUM*, Ralfs.

Pegu, Eng-ga-na (3242).

*74. *EUASTRUM AMPULLACEUM*, Ralfs.

Pegu, Kya Eng.

* These are only stray Desmids found by DD. Zeller and Rabenhorst amongst the Algæ. My collection of Burmese Desmids is in the hands of Mr. W. Archer of Dublin. (S. Kütz.)

ZYGNEACEÆ.

*74. RHYNCHONEMA KURZII, Z., n. sp.

Articulis sterilibus fine replicatis, diametro (1/120—1/100 lin.) 6-8plo longioribus, sporiferis tumidis; sporis fuscis, ellipticis, diametro (1/40 lin.) 2-2½plo longioribus; fasciis spiralibus 2 laxis, torulosis, anfractibus 2. Pegu, Eng-ga-na (3242).

*75. SPIROGYRA ADNATA, Kg.

Pegu, Pazwoondoung, Balachoung (3247).

*76. SPIROGYRA CRASSA, Kg.

In lacu prope Rangoon (3251).

*77. SPIROGYRA DECIMINA, Kg.

Prome, Toung-naweng-choung (3155); Myoma, in rupibus fluminis Irrawaddi (3170); Pegu, Kenbatee in fonte scaturiente (3165/a); Pazwoondoung-choung ad Kyauzoo (3184). Alga vulgatissima Burmæ, præsertim in planitiibus alluvialibus.

Forma *crassior*, filis sterilibus ad 1/38 lin. crassis. Pegu, in montibus Yomæ centralis, Wathabwot-choung, in fluvio frequens (3174).

*78. SPIROGYRA IRREGULARIS, Næg.

Pegu, Yomah centralis, Wopyoo-choung (Khayengmathay-chg.) versus Ghalee Tay natans (3177); Rangoon in canalibus æstuariis subsalsis (3204).

*79. SPIROGYRA JUGALIS, Kg.

Pegu, Kya Eng (3198).

*80. SPIROGYRA LONGATA, Kg.

Prome, Khyee Thay in flumine Irrawaddi (3137); Arracan, Akyab (3211).

*81. SPIROGYRA MAJUSCULA, Kg.

Pegu, in palude quadam prope Thounggyee (3244).

*82. SPIROGYRA NITIDA, Kg.

Pegu, in palude inter Theanchoung et Oakkan (3161/a); Prome, Khyee-thay in flumine Irrawaddi (3137); Arracan, Akyab, in aqua dulci (3219).

*83. SPIROGYRA QUININA, Kg.

Arracan, Akyab in aqua subsalsa (3289).

var. *β*. inæqualis, Næg. Pegu, Beeling Kadeng-choung ad Kway ma-kheing (3232).

*84. SPIROGYRA TROPICA, Kg.

Arracan, Akyab, in aqua subsalsa (3289).

*85. *ZYGNEMA STELLINUM*, Ag.

Pegu, Tonkyan in vicinitate rivuli Bala-choung (3289).

*86. *ZYGNEMA VAUCHERII*, Ag.

Pegu, Kya Eng (3194).

*87. *ZYGNEMA AMPLUM*, Z., n. sp.

Viride, siccatum obscure fuscum; articulis sterilibus diametro (1/60 lin.) ante divisionem 2-3plo longioribus, post eam æqualibus, v. sesquilon-gioribus; fructiferis non tumidis, zygosporis globosis, v. late ellipticis; filis in vagina 1/40 lin. crassa, tenui, continua, subtiliter granulosa, hyalina, inclusis. Pegu, in laculo inter Phounggyee et Kyauzoo (3246).

*88. *MESOCARPUS INTRICATUS*, Hass.

Pegu, in palude inter Tean-choung et Oakkan (3161).

*89. *MESOCARPUS SCALARIS*, Hass.

Pegu, Eng-ga-na (3242); Yoma australis, infra pagum Karensium Mui-hau dictum in rivulo (3256).

*90. *STAUROSPERMUM FRAGILE*, Z., n. sp.

Filis luteolis, intricatis, fragilibus; cellulis diametro (1/140—1/100 lin.) 5-10plo longioribus, ad genicula contractis; zygosporis quadrangularibus, 1/100—1/80 lin. crassis; sporodermate lævi. Pegu, Rangoon in lacu (3252); Kadeng-choung ad Natmadhee (3223). In provincia Pegu, præcipue secus fl. Irrawaddi, vulgaris.

*VAUCHERIACEÆ.**91. *VAUCHERIA SESSILIS*, DC., a. *cespitosa*, Ag.

Pegu, Yoma centralis, Khayeng-mathay-choung (3172); var. b. *repens*, Hass. (forma terrestris); ibidem, in limo siccescente (3181).

*ULVACEÆ.*92. *ENTEROMORPHA COMPRESSA*, L., var. c. *complanata* (*E. complanata*, Kg.).

Pegu, Elephant-point in rhizophoretis (3278); Arracan, Akyab, in mari (3281, 3284).

*93. *PHYCOSERIS BURMANICA*, Z., n. sp.

Viridis, in sicco sæpius pallide olivacea, radice minuta, disciformi; stipite tenerimo, rotundato, brevi, mox in phycoma planum, rigidum, basi oblique cuneatum atque attenuatum, obovatum, rectum v. curvatum, 1-2 pollicare, margine in adultioribus crenulatum, transiente. Cellularum diameter 1/300 lin. Pegu, Elephant-point, in rhizophoretis ad radices.

DIPLOSTROMIÆ.

*94. DIPLOSTROMIUM TENUISSIMUM, Kg.

Pegu, Elephant-point, in rhizophoretis ad radices (3272).

CONFERVACEÆ.

*95. CONFERVA FUNKII, Kg.

Pegu, in palude prope Phounggyee (3244).

*96. CONFERVA RHYPOPHILA, Kg.

Pegu, in planitie fluminis Irrawaddi, Eng-suay in truncis submersis. (3165/c.).

*97. CONFERVA SUBSETACEA, Kg.

Arracan, Akyab in aqua subsalsa (3288).

*98. CONFERVA BURMANICA, Z., n. sp.

Albo-virescens, rigida, intricata; articulis diametro (1/130—1/100 lin) 2½-5 plo longioribus. Pegu, Yenay-eng in planitie fl. Irrawaddi, in plan-
tis aquaticis (3165/6).

*99. CONFERVA UTRICULOSA, Kg.

Pegu, Yoma centralis, Khayeng-mathay-choung, in stagnis natans (3171); Tay Tay-choung (Zamayee) in limo siccescente (3179).

*100. CONFERVA INÆQUALIS, Rabenh. (*Psychohormium*, Kg.); forma, filis ad 1/120 lin. crassis. Rangoon in aqua vadosa lacus natans (3243).

*101. RHIZOCLONIUM HOOKERI, Kg.

Pegu, Elephant-point in limo marino (3260).

*102. RHIZOCLONIUM ARBOREUM, Z., n. sp.

Obscure viride, siccatum cinerascens; filis a basi apicem versus paulo attenuatis, hinc inde ad genicula intumescens, brevissime radican-
tibus et geniflexis; articulis diametro (1/35—1/25 lin.) æqualibus, vel duplo lon-
gioribus; cytiodermate crasso. Pegu, Elephant-point, in rhizophoretis ad
corticem arborum (*Sonneratia apetala*) frequentissime truncorum latus ad
septentrionem vergens dense investiens (3261).

103. CLADOPHORA CALLICOMA, Kg. (*Cl. glomerata*, forma III. Rabenh.) Pegu, Kadeng-choung ad Natmadhee. (3225).

*104. CLADOPHORA JAVANICA, Kg.

Ibidem (3226).

*105. CLADOPHORA STREPENS, Kg. (*Cl. fracta* c. *strepens*, Kg.).

Pegu, Yoma centralis, Wopyoo, choung (Khayeng-mathay-chg.) versus
Ghalee Tay (3177).

106. *CLADOPHORA TRANQUEBARIENSIS*, Kg.

Pegu, Yoma centralis, Tay Tay-choung, natans (3183).

*107. *CLADOPHORA CODIOLA*, Z., n. sp.

Cespitosa, viridis, sicca pallida, pygmæa, vix 2 lin. longa, subsimplex; filis 1/100—1/75 crassis, apice incrassatis, obtusis; ramellis raris, uni-articulatis; articulis diametro 8-20 plo et ultra longioribus, infimo perlongo; cytiodermate crasso, hyalino, lævi; cytioplasmate granulati. Pegu, Irrawaddi, Eng-suay in truncis submersis (3166).

108. *CLADOPHORA EXIGUA*, Z., n. sp.

Sordide viridis, cespite 1-2 lin. alto; filis inferne ramosis, rigidis; ramis paucis, divaricatis, elongatis; articulis primariis 1/100 ad 1/90 lin., mediis 1/160 lin., ramorum 1/350—1/250 lin. crassis, diametro 2-3plo longioribus, ad genicula constrictis; cytiodermate crassiusculo. Pegu, Balachoung, in conchis (*Paludina*.) (3197).

*109. *CLADOPHORA (ÆGAGROPILA) CONTORTA*, Z., n. sp.

Cespitosa, pallide viridis, filis e radice pulposa provenienti, simplicibus, perraro ramellum uniarticulatum emittentibus, 2-4 poll. longis, in funiculos contortis, basi 1/80 lin., sursum ad 1/35 lin. apice 1/100 lin. crassis; articulis cylindricis, valde inæqualibus, diametro 2-12 plo longioribus. Pegu Tonghoo, in fundo naviculi in fluvio Sittang (3143).

110. *CLADOPHORA MINUTISSIMA*, Z. (ad interim).

Pallide viridis, filis in cortice truncorum radicanibus, dense aggregatis, semilineam vix superantibus, 1/250—1/150 lin. crassis, simplicibus, v. raro ramello unicellulari instructis, a basi apicem versus incrassatis; articulis diametro 1½-3plo longioribus; cytiodermate flaccido, hyalino, cytioplasmate lamelloso. (Forsan *Cladophoræ* cujusdam status juvenilis). Marina Elephant-point in truncis submersis (3264).

*ÆDOGONIACEÆ.**111. *ÆDOGONIUM APOPHYSATUM*, A. Br.

Pegu, Kya Eng (3195).

*112. *ÆDOGONIUM BRAUNII*, Kg.

Pegu, Eng-suay non procul a flumine Irrawaddi infra Henzadah (3166/a); Kadeng-choung ad Natmadhee (3229).

*113. *ÆDOGONIUM GRACILE*, Kg.

Pegu, Eng-suay in truncis submersis (3165/d).

*114. *ÆDOGONIUM LANDSBOROUGHII*, Kg.

Pegu, prope Tonkyan supra Rangoon (3248).

*115. *ÆDOGONIUM ROTHII*, Bréb.

In lacu Rangoonensi fluitans (3253).

*116. *EDOGONIUM SCUTATUM*, Kg.

Pegu, Kya Eng in radicibus (3195).

*117. *EDOGONIUM TENELLUM*, Kg.

Pegu, in stagnis et fossis prope Tonkyan, vicum supra Rangoon (3248).

*118. *EDOGONIUM VESICATUM*, Link.

Pegu, Eng-ga-na (3242); Yoma centralis, Zamayee-choung in saxis arenosis (3233).

var. g. *fuscescens*, Kg.

Pegu, Kya-eng in radicibus (3193).

*119. *EDOGONIUM KURZII*, Z., n. sp.

Monœcum; cellula basilari biloba, articulo terminali obtuso, articulis diametro (1/45—1/32 lin.) 2-5 plo longioribus, sæpe medio dilatatis, v. cuneiformibus, passim uno fine transversim plicatis; oogoniis sparsis, raro seriatis, ellipticis, diametro (1/30 lin.) 1½-2 plo longioribus; oosporis fuscis, sphaericis, v. diametro paulum longioribus; antheridiis unicellularibus, lanceolatis, medio constrictis. Pegu, in palude prope Wanet (3255).

*120. *BULBOCHLETE INTERMEDIA*, De Bary.

Pegu, Kya Eng (3195, 3203).

*121. *BULBOCHLETE PEGUANA*, Z., n. sp.

Dense intricata, repetite ramosissima, ramis alternis vel oppositis, sensim attenuatis et setis longis, vix 1/1500 lin. crassis, terminatis; articulis filii primarii ad 1/200 lin. crassi 2-3 plo, ramorum 1/300—1/500 lin. crassorum 5 plo et ultra longioribus; oosporis ignotis. Pegu, Yoma centralis, ad rupes calcareo-siliceas inter muscos in cacumine montis Kambala-toung, alt. 3200 ped. s. m. (3459).

*ULOTHRICHACEÆ.**122. *ULOTHRIX SUBTILIS*, Kg.

Pegu, Eng-ga-na (3242).

*123. *SCHIZOGONIUM TENUISSIMUM*, Z., n. sp.

Pallide flavo-virens, filis simplicibus 1/500—1/375 lin. crassis, passim ramellosis; cellulis diametro duplo longioribus, gonidiis oblongis. Martabania, in Chinchonæ plantationibus, 3500 ped. altitudinis, in rivulo Opo-choung, Shantoungyee (3142).

*CHROOLEPIDÆ.**124. *CHROOLEPUS FLAVUM*, Kg.

Yoma centralis, ad bambusarum culmos (3144).

var. filis tenuioribus, articulis longioribus, *Chr. flavi* et *elongati* intermedium. Yoma, ad arborum corticem frequens (3145).

*125. *CHROOLEPUS LAGENIFERUM*, Hildebrand.

In lacu Rangoonensi, inter *Confervam inæqualem* in aqua vadosa natans (3243).

*126. *CHROOLEPUS UMBRINUM*, Kg. (*Protococcus crustaceus*, Kg.).

Pegu, Yoma, Yaitho-choung, corticola, frequens (3148).

*127. *CHROOLEPUS BOTRYOIDES*, Z., n. sp.

Cespitate siccitate pallide luteo, villosa, 2-3 lin. alto; filis flaccidis, ad 1/100 lin. crassis, lævibus; ramis subsecundis, divaricatis, attenuatis, apice, 1/250 lin. crassis; articulis diametro $1\frac{1}{2}$ -2 plo longioribus; spermatis globosis, minutis, plerumque ad latera ramorum in cumulos botryomorphos aggregatis. Pegu, Yoma, in cortice arborum (3147).

128. *CHROOLEPUS CALAMICOLA*, Z., n. sp.

Cespitate intricato, viridi, (in sicco pallide lutescente); filis ramosis, ramis attenuatis, subsecundis, divaricatis; articulis infimis 1/120 lin. crassis, diametro sesquolongioribus; superioribus diametro (1/300 ad 1/180 lin.) 2-4 plo longioribus; spermatis plerumque lateralibus, raro terminalibus, sessilibus, globosis v. ellipticis, 1/180 lin. crassis, solitariis, v. seriatis. Supra Rangoon, in silvis sempervirentibus in foliis Calami (3467).

*129. *CHROOLEPUS ELONGATUM*, Z., n. sp.

Cespitosum, siccitate flavo-cinereum, filis rectis, rigidis, 1/150 lin. crassis, ramosis; ramis secundis, valde elongatis, acuminatis, 1/300—1/225 lin. crassis; articulis primariis diametro duplo, ramorum 4-6 plo longioribus; spermatis ignotis. Pegu, Yoma, Yaitho-choung, in cortice arborum in sylvis sempervirentibus (3148).

*130. *CHROOLEPUS FUSCO-ATRUM*, Z., n. sp.

Strato tenui, crustaceo, fusco-atro (in sicco); filis brevibus, rectis, v. parum curvatis, torulosis; ramis divaricatis; articulis fuscis, 1/400—1/300 lin. crassis, globosis, v. late ellipticis. Pegu, in valle Choungmenah (Kha-boung) non procul a Tonghoo, in sylvis sempervirentibus (3469).

*131. *CHROOLEPUS KURZII*, Z., n. sp.

Semipollicare, viride, cespitosum, in fasciculos conicos dense implicatum, filis primariis ad 1/125 lin., ramorum ad 1/300 lin. crassis; articulis diametro 2-4 plo (rarius pluries) longioribus; ramis divaricatis, subsecundis; spermatis lateralibus, creberrimis, seriatis, sessilibus v. breviter petiolatis, initio globosis, deinde crateriformibus, 1/250—1/60 lin. crassis. Pegu, Tonghoo, Choungmenah-choung in sylvis sempervirentibus ad folia fruticum (præcipue *Alsodeiæ*) (3149).

*132. *CHROOLEPUS TENUE*, Z., n. sp.

Cespitulis exiguis, gregariis, aurantiacis, siccatis cinereis; filis primariis 1/375—1/300 lin. crassis, varie flexuosis; ramis divaricatis, interdum recurvis, 1/500—1/400 lin. crassis; articulis diametro æqualibus, vel ad duplum longioribus, torulosis; spermatiis globosis, terminalibus et lateralibus. *Chr. abietino* proximum, sed articulis omnibus plus minus inflatis, brevioribus et tenuioribus distinguendum. Pegu, Elephant-point, in rhizophoretis ad corticem *Sonneratiæ apetalæ* frequens (3268).

*CHÆTOPHORACEÆ.**133. *STIGEOCLONIUM TENUE*, H., *γ. gracile*, Kg.

Pegu, Beendau Eng in caulibus Polygoni (3141).

*134. *STIGEOCLONIUM RANGOONICUM* Z., n. sp.

Cespite vix 1½ lin. alto, dilute viridi, vel lutescente, dense implicato; filis primariis 1/375—1/250 lin. crassis; ramis subdichotome secundis, ad 1/900 lin. crassitiem attenuatis, flaccidis; articulis valde inæqualibus, diametrum æquantibus torulosis, ad genicula leviter constrictis, vel cylindricis et ea 2-6plo longioribus. In cisterna quadam oppidi Rangoon (3249).

*135. *CHÆTOPHORA PISIFORMIS*, Ag.

Pegu, Phounggyee in laculo ad radices submersas (3190); Prome, Myitmakha-choung ad Gho-tau, in plantis aquaticis (3140).

*136. *CHÆTOPHORA RADIAN*s, Kg.

Pegu, Kya Eng in radicibus (3193).

*137. *CHÆTOPHORA TUBERCULOSA*, Kg.

Pegu, in laculo inter Phounggyee et Kyauzoo (3245).

*138. *CHÆTOPHORA STRICTA*, Z., n. sp.

Viridis, expansa, mollis, 1-2 lin. crassa; filis internis repetite et dichotome ramosis, strictis; ramis attenuatis, gracilibus, non piliferis; articulis oblongis, ad 1/350 lin. crassis, diametro 1½-3plo longioribus. Pegu, Kadeng-choung at Natmadhee in ramis emortuis submersis (3231); Prome, Khjee-thay, ad silices rivuli tenui aqua fluentis in flumine Irrawaddi (3136).

*139. *GONGROSIRA PYGMÆA*, Kg.

Forma *tenuis*, non ultra 1/180 lin. crassa. Rangoon, ad rudera lateritia submersa (3250).

140. *GONGROSIRA ONUSTA*, Z., n. sp.

Flavo-viridis, cespitibus confluentibus, lineam crassis; filis e basi fibrosa continua articulatis; articulis diametro (1/150—1/100 lin.) 2—3plo longioribus; ramis numerosis, undique egredientibus, moniliformibus; articulis

ramorum omnibus oogonia globosa, ad 1/125 lin. crassa, formantibus; oosporis fuscis, 1/250 lin. crassis. Pegu, Elephant-point secus littora in truncis vetustis inundatis (3262).

CHANTRANSIÆ.

*141. CHANTRANSIA ROSEOLA, Z., n. sp.

Cespitulis minutis, roseo-chalybeis; filis 1/400—1/300 lin. crassis, fastigiatim ramosis; ramis distantibus, erectis; articulis diametro 4plo longioribus. Pegu, Beendau Eng, in caulibus Polygoni (3141).

BATRACHOSPERMÆ.

142. BATRACHOSPERMUM MONILIFORME, Roth.

Pegu, in gurgite profundo paludis prope Phoungyee, ad radices arborum (3188).

HILDENBRANDTIÆ.

*143. HILDENBRANDTIA ARRACANA, Z., n. sp.

Incrustans, indeterminata, vage expansa, arcissime adnata, fusco-purpurea; cellulis 1/700—1/600 lin. crassis, obsolete angulosis, rotundatis, absque ordine coacervatis. Arracan, Akyab in rupibus maritimis frequens, (3282).

CERAMIEÆ.

*144. GONGROCERAS RADICANS, Z., n. sp.

Capillare, repens, pollicare, apicibus rectis, vel parum curvatis, non forcipatis; filis intricatis, subpectinatis, vel repetite dichotomis, radican-
tibus; radiculis numerosis e parti inferiori egredientibus, continuis, vel articu-
latis; articulis cylindricis, diametro nunc $1\frac{1}{2}$ -2plo longioribus, nunc ei
æqualibus, supremis brevioribus; zonis superioribus confluentibus; tetracho-
carpiis plerumque infra apices ramorum verticillatim dispositis. Pegu,
Elephant-point in rhizophoretis ad radices truncosque arborum inundatos,
(3274).

HALYMENTIÆ.

*145. CATENELLA OPUNTIA, Grev.

Pegu, Elephant-point, frequens in rhizophoretis et secus littora in truncis vetustis inundatis, (3265).

GELIDIEÆ.

146. ACROCARPUS INTRICATUS, Kg. (*Gelidium*, Kg., *Sphærococcus*, Ag.).

Arracan, Akyab in rupibus marinis, (3279).

POLYSIPHONIEÆ.

*147. *POLYSIPHONIA SUBADUNCA*, Kg., *major*, ramis crebrioribus, minus strictis.

Pegu, Elephant-point, in rhizophoretis frequens, (3274).

*148. *BOSTRYCHIA INTRICATA*, Mont.

Pegu, Elephant-point, in rhizophoretis frequens, (3263).

*149. *BOSTRYCHIA RIVULARIS*, Harv.

Pegu, Elephant-point, in rhizophoretis ad arborum radices, (3271).

DELESSERIEÆ.

*150. *HYPOGLOSSUM BENGALENSE*, Mart.

Pegu, Elephant-point, in truncis vetustis inundatis ad littora satis frequens, (3266).

*151. *HYPOGLOSSUM LEPRIEURII*, Kg.

Pegu, Elephant-point, in rhizophoretis frequens, (3270).

APPENDIX.

CHARACEÆ BURMANICÆ,* determined by Dr. A. Braun, Professor of Botany in Berlin.

1. *NITELLA ROXBURGHII*, A. Br.

Pegu, Kya Eng, (3295).

2. *NITELLA MICROGLOCHIN*, A. Br. sp. v. subsp. nov. *N. oligospiræ* proxima.

Arracan, in valle Koladyne in stagno quodam silvatico.

3. *N. OLIGOSPIRA*, A. Br.

Pegu, Kya Eng, (3294).

4. *CHARA GYMNOPTIS*, A. Br.

Arracan, frequentissima in oryzetis inundatis vallis Kolodyne, (1964).

* It may not, I think, be uninteresting to insert at this opportunity the few *Characeæ*, which have as yet been found in Burma. I am indebted to Prof. A. Braun who obligingly sent me the list a long time ago, for the names of the species. (S. KURZ.)

ON THE PTEROPIDÆ OF INDIA AND ITS ISLANDS, WITH DESCRIPTIONS OF NEW OR LITTLE KNOWN SPECIES,—by G. E. DOBSON, B. A., M. B., *Staff Surgeon, H. M.'s British Forces.*

(With Plate XIV.)

[Read July 5th, received July 18th, 1873.]

Although Dr. W. Peters has done so much towards clearing up the synonymy of the *Pteropidæ* as well as of other families of Chiroptera, much yet remains to be done before a correct list of the species can be obtained.

The state of confusion into which the species of this family have fallen, in common with most species of Chiroptera, is mainly due to the great imperfection of the original descriptions, from many of which it is impossible to recognise the family to which the species belongs.* This imperfection in description has arisen chiefly from the general ignorance respecting the Order which has prevailed amongst Zoologists, who seem to have shared the vulgar antipathy to these animals, if we may judge from the small amount of attention they have received, and also from the want of proper material in the Museums. Most of the *Pteropidæ* being large bats, and therefore unlikely to be preserved by collectors in spirit, have been described from dried specimens, and this also has added much to the imperfection of the description.

Much work, therefore, remains to be done both in obtaining well-preserved duplicates, in comparing them with the type specimens, and in producing from them descriptions from which it may be possible for naturalists in general to determine the species.

If the species of the genus *Pteropus*, as given by Drs. Peters and Gray,† be enumerated, there will be found to be not less than fifty.

The distribution of these fifty species is as follows:—

Continent of India and Burma,	1
Malay Archipelago,	25
China, Japan, and Loo-choo Islands,	4
Solomon Islands; New Caledonia; New Hebrides; Fiji Islands; Marianne and Viti Islands,	9
Australia,	5
Africa and its Islands,	6

* Thus Dr. J. E. Gray remarks (P. Z. S. Lond., 1866, p. 148)—“The generic characters of *Aello*, as given by Dr. Leach, occupy nearly a page of a quarto book, and yet no one has been able to discover the genus. One could not have a more convincing proof that it is not mere length of character that is required to define a genus.”

† See Peters in Monatsb. Berlin Akad., 1867, p. 323, and Gray's Catalogue of Monkeys, Lemurs and Fruit-eating Bats, 1870.

It is very remarkable that, supposing the localities to be correct or approximately so, one half of the whole number of species is distributed among the small islands of the Malay Archipelago, while a single species—*Pteropus medius*—is the sole representative, hitherto discovered, of the genus in the Continent of India and Burma.

That a large proportion of the species should be found in the Malay Archipelago and adjoining Islands might be expected, as these animals like monkeys can live only where a constant supply of fruit is attainable throughout the whole year, but the same conditions obtain in the greater part of the Peninsula of India, and especially in Equatorial Africa, yet scarcely one-seventh of the whole number has been found in these regions.

The Malay Archipelago is, therefore, either the original and special home of the genus from which a few species have wandered into India and Africa, or many species remain undiscovered in the latter countries, and probably many of the so-called species which go to make up the large number from Malayana have been founded on insufficient grounds.

I have not the least doubt that the real number of species is much less than that recorded, and that many described as new by Temminck and others will, with the accession of additional and more perfectly preserved specimens to the collections hitherto available in our Museums, be found referable to a few really distinct species. This may be especially expected in the case of those species that have been founded on differences in the colour of the fur, which appears to have been regarded by some zoologists as of equal importance with the colour of the feathers in birds.

I have elsewhere* dwelt at some length on the variability of the colour of the fur in many species of bats, and have shown that, in the *Pteropi* especially, individuals belonging to the same species present very different shades of colour according to sex age and season, and probably also, but in a less degree, according to locality.

Differences in the form of the skull and in the teeth have been also used to distinguish the species, but these, though of the greatest importance, are not satisfactory, if alone available as a means of diagnosis, for it should, surely, be possible to distinguish the species of a given vertebrate animal without first finding it necessary to kill and make a skeleton of it.

It is, therefore, desirable that, in the description of species, certain external characters may be given from which the living animal can be known, and these, I believe, may be found in the shape and relative size of the ears, and in the quality and distribution of the fur.

In all the Chiroptera, we find one or more of the organs of special sense greatly developed to supplement or, in some genera, almost wholly replace the visual organs (which in most cases are very rudimentary or, where

* Proc. Zool. Soc. of London, 1873.

moderately developed, can be of little use owing to the nocturnal habits of the animals), and this development varies remarkably according to family, genus, and species.

Thus the peculiar form of the nose-leaf taken with the shape of the ears at once characterises the *Rhinolophidae*, and each species of the family may be distinguished by secondary modifications of these organs alone.

And in those families of bats where the nostrils are not furnished with appendages, the form and relative size of the ear will generally be found to be the most important characters for readily and accurately determining the species, and, next to and with these, the quality and distribution of the fur.

I shall employ this principle of diagnosis in the following descriptions of the species of Frugivorous Bats known to inhabit Continental India and Burma, and the Islands of the Bay of Bengal.

Genus I.—PTEROPUS, Brisson.

Nostrils projecting; upper lip with a vertical groove in front bounded laterally by naked prominences; index finger with a distinct claw, metacarpal bone of second finger shorter than the index finger; wings from the sides of the hairy back; wing-membrane attached to the back of the first phalanx of the second toe; tail none.

Dentition:—*in.* $\frac{4}{4}$; *c.* $\frac{1-1}{1-1}$; *pm.* $\frac{2-2}{3-3}$; *m.* $\frac{3-3}{3-3}$.

A.—Ears acutely pointed.

PTEROPUS MEDIUS. Pl. XIV, Fig. 1.

Pteropus medius, Temminck, Monog. Mammal., I, p. 176.

„ *edwardsii*, (in part) Geoff., Ann. du Mus., vol. xv, p. 92.

„ *leucocephalus*, Hodgson, Journ. As. Soc. Beng., iv, p. 699.

„ *assamensis*, McClelland, Proc. Zool. Soc. Lond., vii, p. 148.

Ears long, with acutely pointed tips, the upper third of the outer margin concave beneath the tip; in fully grown individuals the longest diameter of the opening of the external ear, from the point of junction of the outer and inner margins below to the tip, measures one inch and a half.*

Nostrils projecting, with a deep intervening emargination; upper lip with a narrow vertical groove in front bounded laterally by naked rounded prominences continuous with the integument of the nostrils.

* The length of the ear (anteriorly) as given in the tables of measurements accompanying this paper (and also wherever mentioned in previous papers) has been determined by measuring the distance between the termination of the outer margin below and the tip. The breadth has been ascertained by means of a string passed round the ear posteriorly from the inner to the outer margin.

The ears are naked except at the bases posteriorly, and a narrow triangular portion covered with short hairs terminating towards the middle of the outer margin; anteriorly, the anterior flattened edge of the inner side of the conch is covered from the base upwards for about one-third of the length of the ear.

The face is naked in front of a line joining the inner angles of the eyes, and on either side of the naked space (which corresponds to the position of the nasal bones) a few long fine hairs arise from separate papillæ. The fur is rather dense and moderately long on the back of the head, neck, and shoulders, but short and appressed on the back, narrowing to about two inches in width across the loins. A narrow line of short fur passes outwards on to the wing membrane posterior to the humerus for rather more than half its length; the elbow is quite naked, but a few short hairs cover a narrow portion of the wing-membrane, about one inch and a half long, posterior to the forearm. The femur, and the interfemoral membrane as far as a line corresponding to the position of the semi-circular band on the under surface of the membrane are covered; the tibiæ are naked, or have only a few very short hairs; the feet are quite devoid of hair.

On the under surface, the whole body is well covered; the antebrachial membrane is similarly covered as far as a line drawn from the knee to a point about one inch posterior to the elbow joint, thence the hair passes outwards on the wing-membrane posterior to the forearm, terminating at about the beginning of the distal third of the radius. The thighs are covered, the legs and inter-femoral membrane are quite naked.

The nape of the neck and the shoulders are usually reddish yellow or golden yellow or pale straw colour, but every shade of these colours has been observed, the different colours and intermediate shades appearing to depend on sex, age, season, or locality. The darker shades are usually found in females.

The chest and upper part of the abdomen are either of the same colour as the nape of the neck or of a darker hue. The remainder of the fur black or dark brown often mixed with grayish hairs.

The fur of the neck is coarser and longer than that covering other parts of the body. In most male specimens a circular tuft of rigid unctuous hairs, of a deep reddish yellow colour, is found on each side of the neck, situated midway between the base of the ear and the origin of the ante-humeral portion of the wing-membrane from the shoulder. In a large male obtained near Calcutta, these tufts occupy a space one inch in diameter, and the hairs composing them measure about one-third of an inch in length.

Hab.—India generally, from Kachh to Burma, and from the Himalaya to Ceylon.

To this section of the genus belongs *Pt. edulis*, Péron et Lesueur, from

Java and Sumatra, which has been reported from Tenasserim,* and may probably be found in the Nicobar Islands. This species, the largest of known bats, may be readily distinguished from *Pt. medius* by its ears, and by the distribution and quality of the fur. The ears are proportionately shorter and narrower than in the Indian species, and the concavity of the upper third of the outer margin is much less distinct. In a specimen from Java, in the Indian Museum, the ears are about the same length as in the most adult specimen of *Pt. medius*, while its forearm exceeds that of the latter species by more than two inches, and the tibia by an inch and a half. Compared with *Pt. medius* the light coloured portion of the fur extends further down upon the shoulders, and the breadth across the loins occupied by hair is proportionately much greater: this is well seen when specimens of equal size are compared, the breadth of the fur in this position in the not fully grown *Pt. edulis* being nearly, if not quite, double that in the adult *Pt. medius*. Elsewhere the distribution of the fur is similar in both species, but the hair on the wing-membranes and legs is conspicuously much longer in *Pt. edulis*.

B.—Ears rounded at the tip.

PTEROPUS NICOBARICUS. Pl. XIV, Fig. 2.

Pteropus nicobaricus, Fitzinger, Sitzungs. Wien. Akad., 1860, p. 389, *nomen nudum*.

„ *melanotus*, Blyth, Cat. Mammal. Mus. As. Soc. Beng., 1863, p. 20, *nom. nudum*.

„ *nicobaricus*, Zelebor, Reise der Oester. Freg. 'Novara,' Säugethiere, 1868, p. 11.

Ears rounded off at the tip, their breadth nearly equal to their length; the upper third of the outer margin slightly flattened, not concave, the lower two-thirds convex; in fully grown individuals the longest diameter of the opening of the external ear, from the point of junction of the outer and inner margins below to the tip, scarcely exceeds one inch.

The distribution of the fur of the body is similar to that of *Pt. medius*, but the hair on the wing-membrane is very much shorter.

In some male specimens the colour of the fur also corresponds very closely with that of *Pt. medius*; generally, however, the lighter coloured portions of fur on the nape of the neck, and on the shoulders and chest, are of a deeper hue than in the latter species, usually dark ferruginous red or chestnut; females and young males are commonly *intensely black throughout*; in some female specimens the position of the light-coloured tippet in the male is indicated by a reddish tinge.

* A very badly preserved dried skin of an immature specimen of some species of *Pteropus*, in the Indian Museum, has been identified by Mr. Blyth with *Pt. edulis*, and the locality 'Tenasserim' recorded in his Catalogue. The specimen is in such a very bad condition I am able neither to confirm nor to correct Mr. Blyth's identification.

The skull differs from that of *Pt. medius* in being shorter, wider across the maxillary and nasal bones, and in having nearly all its processes and ridges much more strongly defined. The distance between the small anterior upper premolars exceeds that in *Pt. medius* by one-tenth of an inch. The *foramen ovale* is divided in the centre by a process of bone, in *Pt. medius* it is undivided. A post-orbital process of the zygomatic arch is present, though not so well developed as in *Pt. medius*.

The mandible is shorter and its rami deeper than in *Pt. medius*; the coronoid process is more developed vertically, its posterior margin is nearly straight, not deeply concave, and its superior angle is narrowly, not broadly rounded off as in the latter species.

The teeth are stouter in *Pt. nicobaricus* but their general characters are the same in both species.*

Hab.—Andaman and Nicobar Islands, probably Java also. An old dried specimen in the Indian Museum is labelled Java, but not numbered in Blyth's Catalogue.

Neither Fitzinger nor Blyth described this species, though they invented names for it. Zelebor's description occupies nearly two pages of a quarto book, and very careful measurements of the original specimen are given, yet, as his description is taken from a young individual and contains few really diagnostic characters, I was unable to feel certain that specimens obtained by me last year from the Andamans and Nicobars should be referred to this species. But Dr. Peters has lately, at my request, very kindly compared some specimens sent to him from the Indian Museum with the type specimens of *Pt. nicobaricus* in the Vienna Museum. He informs me that they agree in the form of the ear and feet. With this additional information I feel no hesitation in referring the specimen from which the above description is taken, to that species.

	Pteropus medius.					Pteropus nicobaricus.					Pt. edulis.
	Calcutta.	Maumbhum.	Calcutta.	Pegu.	Assam.	Nicobars.	Andamans.	Andamans.	Andamans.	Java.	Java.
Length, head and body,	9.0	...	7.5	9.0	10.5	10.5	8.8	8.0	9.8	9.0	13.0
" head,	3.1	3.15	2.75	3.0	3.0	3.0	3.0	3.0	2.9	2.8	3.5
" ear (anteriorly),	1.5	1.40	1.45	1.5	1.45	1.05	1.05	1.1	1.05	1.05	1.5
Breadth, ear,	0.85	...	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.75
Length, from ear to tip of nostril,	2.7	...	2.4	2.6	2.8	2.05	2.45	2.5	2.35	2.35	2.9
" from eye to tip of nostril,	1.3	...	1.1	1.15	1.2	1.15	1.15	1.10	1.15	1.05	1.2
" forearms,	6.6	6.7	6.0	6.2	6.3	6.5	5.8	5.9	5.8	5.4	8.5
" thumb,	2.7	2.7	2.8	2.65	2.5	2.8	2.5	2.6	2.6	2.35	3.0
" second finger,	12.5	13.5	11.5	11.8	11.9	12.5	11.0	10.5	11.5	11.5	16.0
" fourth finger,	8.5	8.5	7.8	8.0	8.0	8.5	7.4	7.8	7.8	8.0	10.5
" tibia,	3.0	3.2	2.7	2.8	2.8	3.0	2.8	2.7	2.6	2.6	4.0
" foot and claws,	2.3	2.3	2.0	2.0	2.0	2.0	1.7	2.0	2.0	2.0	2.4
" calcaneum,	1.0	0.9	0.85	0.8	0.8	0.9	0.65	0.85	...	0.75	1.5

* For the dentition of the genus *Pteropus* see De Blainville, Ostéographie.

Genus II.—CYNOPTERUS,* F. Cuvier.

Nostrils projecting; upper lip with a vertical groove in front, bounded laterally by naked prominences; index finger with a distinct claw; metacarpal bone of second finger exceeding slightly in length the index finger; wings from the sides of the hairy back, wing-membrane attached to the base of the first toe; tail short, distinct.

Dentition:—in. $\frac{4}{4}$; c. $\frac{1-1}{1-1}$; pm. $\frac{2-2}{3-3}$; m. $\frac{2-2}{2-2}$.

CYNOPTERUS MARGINATUS. Pl. XIV, Fig. 4.

Pteropus marginatus, Geoffroy, Ann. du Mus. xiv, p. 97.

„ *pyrivorus*, Hodgson, Proc. Zool. Soc. Lond., 1836, p. 36.

Cynopecterus affinis, Gray, Cat. Mammal., 1850, xix, p. 38.

Eleutherura marginata, Gray, Catalogue of Monkeys, Lemurs and Fruit-eating Bats, 1870, p. 118.†

Ears large, rounded at the tip, with a slight but distinct concavity of the outer margin immediately beneath the tip; both the outer and inner margins are bordered with white; the white border along the inner margin is about one-twelfth of an inch wide, and contrasts strongly with the dark brown colour of the ear; the outer margin terminates below without forming a lobe at the base.

Nostrils projecting, with a deep intervening emargination. The upper lip marked in the centre, as in *Pteropus*, with a narrow vertical groove bounded laterally by naked rounded prominences continuous with the integument of the nostrils.

The ears are naked posteriorly except at their bases; anteriorly, a few hairs appear on the conch along the outer side of the white border of the inner margin of the ear, and, similarly, along the inner side of the white border of the outer margin. On the upper surface, the fur of the back extends upon the wing-membrane nearly as far as a line joining the elbow and knee joints, also, thinly, upon the humerus, the femur, and proximal end of the tibia. Beneath, the antebrachial membrane is covered with moder-

* I have placed the genus *Cynopecterus* next *Pteropus* as I believe it presents more affinities with that genus than any of the other genera of *Pteropidae*. The species of these genera agree very closely in the form of the nostrils and of the narrow emargination on the upper lip bounded by naked prominences. In *Cynonycteris* this emargination is wide and deep with slanting sides, altogether very different from the same part in *Pteropus*. In habit also the species of *Cynopecterus* and *Pteropus* perfectly agree; they are all strictly frugivorous bats and live in trees, while the species of *Cynonycteris* are commonly found in caves, and I have been informed that a colony of *C. amplexicaudata* living near the sea were seen to feed on Mollusca left exposed by the tide.

† For a complete list of synonyms of this species see Peters in Monatsb. Berlin Akad., 1867, p. 866, and 1869, p. 395.

ately long thinly spread hairs, and the wing-membrane is clothed to about the same extent as on the upper surface, the hairs also passing outwards in a narrow band posterior to the forearm. The colour of the fur is extremely variable, dark brown, reddish-brown, snuff-brown or olive-brown, sometimes with a bluish tinge throughout.

The first upper premolar is minute, and in the centre of the space between the canine and second premolar; the second premolar is about equal to the lower canine in vertical extent.

CYNOPTERUS MARGINATUS, var. *ANDAMANENSIS*. Pl. XIV, Fig. 5.

This is, I believe, a permanent variety of *C. marginatus*. It is readily distinguished by the small size of the ears which are similarly margined with white. The relative size is very well shown in the accompanying illustration.

Specimens of young individuals of *C. marginatus* from Bengal with forearm bones nearly half an inch shorter than specimens of adult animals of this variety from the Andamans have considerably larger ears.

CYNOPTERUS SHERZERI. Pl. XIV, Fig. 6.

Pachysoma sherzeri, Fitzinger, Sitzungs. Wien. Akad., 1860, p. 389, (*nom. nudum*).

Cynopterus marginatus, var. *Pachysoma Sherzeri*, Zelebor, Reise der Oester. Freg.

'Novara,' Säugethiere, p. 11, 1868.

This species, like *Pteropus nicobaricus*, was named but not described by Fitzinger, and Zelebor regards it as a variety only of *C. marginatus*. It is at once distinguished from that species by its small and narrow ears which are also *not* margined with white. When adult specimens of *C. marginatus* and of this species are compared together, the difference in the size and shape of the ears is very striking.

The muzzle is thicker, and the colour of the fur much darker than in any specimen of *C. marginatus*.

Zelebor mentions that the ears of the specimens obtained at Car-Nicobar are margined with white, but I have been unable to detect even the slightest trace of a white border in the ears of several specimens examined by me. Therefore, either Zelebor has been mistaken, or the white bordering of the ears is not a constant character in this species, or I have wrongly identified the species here described with *C. sherzeri*. But although it is quite impossible to identify the species here described with that obtained during the Novara Expedition at Car-Nicobar Island from Zelebor's description (which consists merely of some unimportant remarks on the colours of the fur, wing-membrane, and eyes), yet as the animals which furnished the above description were taken not only at the same island—Car-Nicobar—but also from the same place on that island, namely, from the leaves of the cocoa-nut palms, I think it highly probable that they

belong to the same species, and, accordingly, to avoid the possibility of introducing a fresh synonym, I have retained Fitzinger's name.

CYNOPTERUS BRACHYSOMA. Pl. XIV, Fig. 7.

Cynopterus brachysoma, Dobson, Journ. A. S. B., 1871, p. 260.

I have little to add to my original description of this species.

The ears are much rounded off above, and the upper third of the outer margin is straight or slightly convex; the presence of a rounded lobe at the base of the outer margin at once distinguishes this species.

The difference in the measurements of the breadth of the ear given with the original description and in the table below is due to the measurement having been taken in the former case across the concavity of the ear, anteriorly; in the latter, by means of a string round the convexity, posteriorly.

Genus III.—CYNONYCTERIS, Peters.

Nostrils projecting; upper lip with a wide groove in front with smooth not elevated margins; index finger with a distinct claw; metacarpal bone of second finger exceeding, or equalling, the index finger in length; wings from the sides of the hairy back; wing-membrane from the base of the second toe; tail short, distinct.

Dentition:—*in.* $\frac{4}{4}$; *c.* $\frac{1-1}{1-1}$; *pm.* $\frac{2-2}{3-3}$; *m.* $\frac{3-3}{3-3}$.

CYNONYCTERIS AMPLEXICAUDATA. Pl. XIV, Fig. 8.

Pteropus amplexicaudatus, Geoff. Ann. du Mus., Vol. xv, p. 96.

„ *Leschenaultii*, Desmarest, Mammal., p. 110.

„ *amplexicaudatus*, Temm., I, p. 200.

„ *seminudus*, Kelaart, Journ. As. Soc. Beng., xxi, p. 345.

„ *Leschenaultii*, Blyth, Cat. Mammal. Mus. As. Soc. Beng., p. 21.

Head long, triangular; upper lip with a wide groove directly continuous with the emargination between the nostrils, the edges of the groove smooth, not thickened as in *Pteropus* or *Cynopterus*; ears moderate, triangular, rounded at the tip, the upper half of the outer margin straight, the lower half convex.

Posteriorly the ears are naked except at their bases, anteriorly the conch is covered with a few very short fine hairs. The fur of the body extends upon the humerus and upon the fleshy part of the forearm, the remaining part to the carpus has only a few very fine hairs. The portion of the back and wing-membrane covered with fur across the loins is not more than an inch in breadth. The interfemoral membrane is densely covered with hair at the root of the tail, and on either side as far as lines drawn from the knee joints to the base of the free portion of the tail; the remaining portion, the legs and a considerable part of the wing-membrane beyond, are clothed with short, thinly-spread fur which extends along the wing membrane and legs

to the back of the feet. Beneath, the ante-humeral membrane is clothed with rather long thinly-spread fur, and the wing-membrane is similarly covered as far as a line drawn from the knee to a point about half an inch posterior to the elbow, whence the fur extends outwards to the carpus. The interfemoral membrane, the legs, and the feet are covered with a few very short hairs.

First upper premolar minute, equally distant from the canine and second premolar; second premolar exceeding lower canine in vertical extent; first lower premolar small, less than half the size of the second premolar; second premolar nearly equal to lower canine in vertical extent.

Hab.—From the Persian Gulf to the Philippine Islands. Bengal; Southern India; Ceylon; Burma; Celebes; Amboyna; Timor; Aru Islands.

CYNONYCTERIS MINOR, n. sp. Pl. XIV, Fig. 9.

Ears smaller and much narrower than in *C. amplexicaudata*; muzzle also proportionately shorter.

The minute first upper premolar is closely wedged in between the canine and second premolar; in *C. amplexicaudata* it is separated by a narrow interval from both these teeth.

The distribution of the fur is somewhat similar to that of *C. amplexicaudatus*, but it is much shorter on the wing-membrane and almost absent from the backs of the tibiae, from the adjoining portions of wing-membrane, and from the feet.

Hab.—Java.

	Cynopterus.								Cynonycteris.		
	C. marginatus.		C. andamanensis.			C. sherzeri.		C. brachysoma.	C. amplexicaudatus.		C. minor.
	Calcutta.	Darjeeling.	Andamans.	Andamans.	Andamans.	Car-Nicobar.	Car-Nicobar.	Andamans.	Persian Gulf.	Bengal.	Java.
	♂	♂	♀	♂	♀	♀	♀	♀	♂	♂	♀
Length, head and body,	4.4	3.9	3.7	3.3	3.4	3.75	3.7	2.9	4.1	4.3	3.7
" tail,	0.4	0.6	0.4	0.35	0.4	0.55	0.55	0.25	0.65	0.65	0.45
" head,	1.5	1.5	1.4	1.3	1.4	1.25	1.3	1.25	1.7	1.7	1.55
" ear (anteriorly),	1.0	0.9	0.7	0.7	0.68	0.6	0.63	0.6	0.8	0.8	0.68
Breadth, ear,	0.6	0.6	0.4	0.4	0.4	0.3	0.32	0.4	0.55	0.55	0.35
Length, from ear to tip of nostril, .....	...	1.2	1.15	1.0	1.15	1.0	1.05	1.0	1.4	1.4	1.3
" from eye to tip of nostril, .....	...	0.5	0.5	0.48	0.48	0.45	0.45	0.4	0.65	0.6	0.45
" forearm,	3.0	2.9	2.6	2.6	2.8	2.7	2.7	2.2	3.2	3.15	2.8
" thumb,	1.1	1.1	1.0	0.95	1.0	1.0	1.0	0.9	1.25	1.0	0.9
" second finger,	5.0	4.9	4.7	4.2	4.7	4.7	4.75	4.0	5.4	5.2	4.4
" fourth finger,	3.7	3.5	3.3	3.1	3.5	3.4	3.5	3.0	3.7	3.9	3.3
" tibia,	1.1	1.1	1.0	0.95	1.05	1.0	1.0	0.8	1.35	1.4	1.05
" foot and claws,	0.7	0.7	0.6	0.55	0.6	0.6	0.6	0.5	1.0	0.85	0.75

Genus IV.—EONYCTERIS, (nov.)

Nostrils not projecting; upper lip with a shallow vertical groove in front; index finger without a claw; thumb short, part of terminal phalanx included in the wing-membrane; metacarpal bone of second finger equal to the index finger in length; wings from the sides of the hairy back; wing-membrane from the base of the first toe; tail short, distinct.

Dentition :—*in.* $\frac{4}{4}$; *c.* $\frac{1-1}{1-1}$; *pm.* $\frac{2-2}{3-3}$; *m.* $\frac{3-3}{3-3}$.

First upper premolar minute.

EONYCTERIS SPELÆA. Pl. XIV, Fig. 10.

Macroglossus spelæus, Dobson, Journ. A. S. B., 1871, p. 261, pl. x, fig. 3, 4.

When first describing this species, I placed it in the genus *Macroglossus* on account of its very close resemblance to *M. minimus*, the type of that genus, in the form, number and arrangement of the teeth. Subsequently, however, in the MS. of a 'Catalogue of Chiroptera in the Indian Museum' I placed it in a separate subgenus '*Eonycteris*' on account of the very different attachment of the wing-membrane to the foot and sides. Lately, Dr. Peters writes to me that he is convinced, after a very careful examination of specimens sent to him from the Indian Museum, that the differences existing between this species and *M. minimus* are of generic importance, and require the formation of a new genus for its reception.

Since I described this species in 1871 I have come to regard the dentition of the Chiroptera as of less importance in their classification than many other characters. I believe that, although the teeth of *Macroglossus minimus* and *Eonycteris spelæa* correspond very closely, these species yet present many structural differences of more than subgeneric importance, and I agree with Dr. Peters that the latter species should be placed in a separate genus. I have, accordingly, raised my subgenus '*Eonycteris*' to the rank of a distinct genus of *Pteropidæ*.

Genus V.—MACROGLOSSUS, F. Cuvier.

Nostrils not projecting, upper lip not grooved in front; index finger with a distinct claw; thumb moderate; metacarpal bone of second finger equal to, or longer than, index finger; wings from the sides, their points of attachment separated by a considerable interval from the spine: wing-membrane from the base of the fourth toe; tail very short.

Dentition :—*in.* $\frac{4}{4}$; *c.* $\frac{1-1}{1-1}$; *pm.* $\frac{2-2}{3-3}$; *m.* $\frac{3-3}{3-3}$.

First upper premolar nearly equal in size to the second.

MACROGLOSSUS MINIMUS. Pl. XIV, Fig. 11.

Pteropus minimus, Geoff. Ann. du Mus., xv, p. 97.

Macroglossus minimus, Temminck, Monogr. de Mammal., I, p. 191.

Pteropus rostratus, Horsfield, Zool. Researches in Java.

This species is so well-known, and has been redescribed so carefully by Temminck, that no further description of it is here necessary.

It is found in abundance in the deep warm valleys about Darjiling. It extends from India through Burma to the Malay Archipelago.

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DESCRIPTION OF A NEW SPECIES OF VESPERTILIO FROM THE NORTH-WESTERN HIMALAYA,—by G. E. DOBSON, B. A., M. B.

VESPERTILIO MURINOIDES, n. sp., Pl. XIV, Fig. 12.

This species is closely allied to *V. murinus* of Europe, from which, however, it is readily distinguished by the following characters:—

The general form of the ear is triangular, with narrow rounded tips: the inner margin is very faintly convex, almost straight, in its upper third, and the outer margin is concave beneath the tip, the remaining portion convex with a faint concavity opposite the base of the tragus.

In *V. murinus* the inner margin of the ear is strongly convex from the base to the tip, the concavity of the outer margin beneath the tip is very feeble, and there is a distinct emargination, almost angular, opposite the base of the tragus, succeeded by a well-developed terminal lobe; the general form of the ear is, moreover, oval, not triangular.

The tragus is slender and acutely pointed, with a quadrangular lobe at the base of its outer margin. In *V. murinus* the tragus is subacutely pointed, and the lobe at the base of the tragus is remarkably small.\*

The fur is dark brown above, with light brown tips; beneath, dark brown, almost black, with grayish tips.

The first upper premolar is very small, scarcely visible from without, and not much larger than the second. In *V. murinus* this tooth is distinctly visible from without and much larger than the second premolar.

The specimen (an adult female preserved in spirit) from which the above description is taken, was obtained at Chamba, at an elevation of about 3000 feet, by H. McLeod Hutchison, Esq., H. M.'s 14th Regiment.

\* The relative shape and size of the ears and tragi of *V. murinus* and *V. murinoides* are well shown in Pl. XIV, figs. 12, 13.

A dried specimen in the Indian Museum, labelled *V. murinus*, belongs also to this species. It is said in Blyth's Catalogue to have been sent from Masuri by Captain Hutton. The measurements of both specimens compared with those of *V. murinus*, L. from Europe are as follows:—

|                              | <i>V. murinoides.</i> |      | <i>V. murinus.</i> |      |
|------------------------------|-----------------------|------|--------------------|------|
|                              | ♂                     | ♀    | ♂                  | ♀    |
| Length, head and body, ..... | 2.7                   | 2.5  | 2.7                | 3.0  |
| " tail, .....                | 2.1                   | 2.1  | 1.9                | 2.3  |
| " head, .....                | 0.95                  | 0.9  | 1.05               | 1.1  |
| " ear, (anteriorly), .....   | 0.8                   | 0.85 | 1.0                | 1.0  |
| Breadth, ditto, .....        | ...                   | 0.58 | 0.75               | 0.75 |
| Length, tragus, .....        | ...                   | 0.4  | 0.1                | 0.5  |
| Breadth, ditto, .....        | ...                   | 0.1  | 0.12               | 0.12 |
| Length, forearm, .....       | 2.2                   | 2.1  | 2.25               | 2.5  |
| " thumb, .....               | ...                   | 0.4  | 0.5                | 0.5  |
| " second finger, .....       | 3.75                  | 3.4  | 3.3                | 4.3  |
| " fourth ditto, .....        | 2.8                   | 2.8  | 2.65               | 3.3  |
| " tibia, .....               | 0.9                   | 0.9  | 0.95               | 1.05 |
| " calcaneum, .....           | 0.9                   | 0.9  | 0.7                | 0.9  |
| " foot and claws, .....      | 0.5                   | 0.5  | 0.5                | 0.6  |

The measurements given in the third column are those of a not fully grown specimen of *V. murinus*.

#### *Explanation of Plate XIV.*

1. Ear of *Pteropus medius*.
2. " " *nicobaricus*.
3. " " *edulis*.
4. " *Cynopterus marginatus*.
5. " " " var. *andamanensis*.
6. " " *sherzeri*.
7. " " *brachysoma*.
8. " *Cynonycteris amplexicaudata*.
9. " " *minor*.
10. " *Eonycteris spelæa*.
11. " *Macroglossus minimus*.
12. " *Vespertilio murinoides*.
13. " " *murinus*.
14. " *Murina cyclotis*.



# JOURNAL OF THE ASIATIC SOCIETY.

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## Part II.—PHYSICAL SCIENCE.

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No. IV.—1873.

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DESCRIPTIONS OF NEW SPECIES OF UNIONIDÆ.—By W. THEOBALD, Esq

[Received July 29th, 1873; read August 6th, 1873.]

(With plate XVII.)

UNIO BHAMOENSIS, n. s., Pl. XVII, Fig. 1.

*Testâ subtriangulato-ovatâ, postice acuminatâ, margine centrali modice rotundato, umbonibus tumidiusculis, lævigatis, pustulis parvis aliquando armatis, decorticatis. Epidermide tenuissimâ, lævi, subpolitâ, læte viridi, in senioribus flavescente. Testâ concentrice subrugatâ, lineis paucis sive rugis angustis ligamentum versus plus minusve subradiatim notatâ, et antice rugis paucis perbrevibus leviter corrugatâ. Dentibus cardinalibus lamellatis, et denticulatis, in valvâ dextrâ singulo, multifisso, in sinistrâ gemino, posteriore triangulari et umbonem juxta posito, anteriore lamelliformi, striato. Nacréâ argenteâ et iridescente.*

*Hab. prope Bhamo, regno Birmanico; necnon in Prome occidentali Provinciâ Pegu.*

*Lat. 52, alt. 40, crass. 26 mm.*

A rare species in Western Prome where alone I have met with it in Pegu, and remarkable for its smooth thin epidermis. The posterior slope alone is conspicuously ornamented with sculpture, but in my largest specimen from Bhamo and in some others also, the peculiar sculpturing of *U. burmanus*, W. Blfd. is faintly but distinctly perceptible over part of the valves towards the umbones especially. A small specimen of 36 mm. from Western Prome exhibits distinctly also the two rows of spines which characterise the next species, so that it seems that *U. burmanus*, *U. bhamoensis*

and *U. mandelayensis* constitute a natural little sub-group of osculant species at once distinct, but connected and sufficiently distinguishable from any of the ordinary Indian types. I have not, however, felt justified in separating them from the great Indian "*corrugatus*" group in my forthcoming catalogue of Indian shells.

UNIO MANDELAYENSIS, n. s., Pl. XVII, Fig. 2.

*Testâ cuneate subtriangulari, margine ligamentali recto, ventrali, rotundato; valde inæquilaterali: antice lævi, umbones versus leviter corrugatâ; postice ab umbonibus usque ad angulam posteriorem fortiter plicato-corrugatâ. Epidermide lævi, tenui, subpolitâ, glaucâ sive viridi-flavâ, lineis plurimis radiantibus obscure pictâ. Umbonibus decorticatis, granulosis, lineis duobus pallidis 5-6 muricate spinigeris, ornatis. Lineis ad marginem tendentibus, spinis vero vix ad medium valvæ attingentibus. Dentibus sicut in precedente.*

*Hab. prope Mandelay, regno Birmanico.*

*Lat. 53, alt. 40, crass. 31 mm.*

In only one specimen have I seen the muricate spines descend below the centre of the valves, but the pale linear bands whereon they stand usually descend to the margin.

The peculiar sculpturing of *U. burmanus* is also seen in this species though less strongly marked, and though sometimes carried over a good portion of the valves, yet is usually most pronounced on the posterior slope.

UNIO FEDDENI, n. s., Pl. XV., Fig. 3.

*Testâ quadrato-ovali, concentrice sulcatâ, antice gibbose rotundatâ, postice dilatâ, subtruncatâ; parum inæquilaterali. Umbonibus decorticatis, haud prominentibus. Epidermide lævi, subpolitâ, viridescenti-flavâ. Dentibus cardinalibus lamelliformibus, striatis; in valvâ dextrâ singulo, serrato, in sinistrâ geminis triangularibus, striatis et serratis. Nacré cærulescenti-albidâ.*

*Hab. in Peemgunga fluvio, Indiæ centralis. Teste F. Fedden.*

*Lat. 40, alt. 29.5, crass. 19 mm.*

This very peculiar and marked form which somewhat recalls by its outline the American *U. securis*, seems a rare species and was collected sparingly among numbers of fine specimens of *U. veyungensis*, Lea, in Central India by my colleague Mr. Fedden after whom I have named it. It falls naturally within the great "*corrugatus*" group, though there are few better marked varieties than it.

UNIO GOWHATTENSIS, n. s., Pl. XVII, Fig. 4.

*Testâ quadrato-ovatâ, antice rotundatâ, postice declive truncatâ, margine ventrali recto. Umbonibus decorticatis. Epidermide flavescente, postice*

*viridescente. Testâ concentrice striatâ et rugis plurimis minutis valde approximantibus angulariter seu fulgurate granuloso-crispatâ, postice tantum radiatim granuloso-crispatâ. Dentibus cardinalibus bifidis in utrâque valvâ. Nacrea cærulescenti-albidâ, iridescente. In senioribus granulationes valde inconspicuæ fiunt.*

*Hab. prope Gowhatti in Assam.\**

*Lat. 39, alt. 25.5, crass. 18 mm.*

The only other *Unio* that I am acquainted with possessing the peculiar fulgurate and granulose sculpture of this species is *U. crispisulcatus*, B., and to that group it must be referred, for greatly as the two species at first sight would seem to differ I have little doubt that intermediate forms connecting them will eventually be discovered. Fig. 4a represents the sculpture enlarged and fig. 4b that of *U. crispisulcatus*, B. for comparison.

MONOCONDYLEA AVE, n. s., Pl. XVII, Fig. 5.

*Testâ oblongâ, solidiusculâ, antice rotundatâ, postice curvatim truncatâ. Margine ventrali recto; ligamentali convexo. Umbonibus decorticatis. Epidermide piceâ, in junioribus luteo-flavescente lineis tenuibus obscure radiatim notatâ. Testâ incrementi lineis concentrice rugatâ, postice plicis paucis raro notatâ et valde evanescentibus. Dentibus minimis ut in *M. salweeniana*. Nacrea cærulescente, umbones versus flavescente.*

*Hab. prope Mandalay regno Birmanico.*

*Lat. 96, alt. 52, crass. 28 mm.*

This species differs considerably from the ordinary forms of *M. salweeniana* by its great smoothness and its elongated form. It resembles in the former respect the Philippine *M. Cumingi*, Lea, and young specimens sometimes exhibit a trace of faint sculpturing along the posterior slope much as in *M. inoscularis*, Gould, but all the adults I have seen have been quite devoid of sculpture.

SPHERIUM AVANUM, n. s., Pl. XVII, Fig. 6.

*Testâ quadrate rotundâ, tumidâ, antice rotundatâ, postice truncatâ, dilatâ, equilaterali. Epidermide, leviter et concentricè corrugatâ, postice levissime radiatâ. Umbonibus prominentibus, tumidis, osculantibus; colore pallide stramineo, tribus fasciis purpureis umbonalibus radiatim picto. Ligamento umbones versus inflato.*

*Hab. prope Ava.*

*Lat 7.5, alt. 6.6, crass. 5.2 mm.*

A single specimen of this rotund or pisiform species occurred among a number of specimens of *Corbicula* and other fresh-water shells received from Ava.

\* Obtained by one of the collectors of the Indian Museum.—[Ed.]

ON THE MUDDY WATER OF THE HUGLI DURING THE RAINY SEASON WITH  
REFERENCE TO ITS PURIFICATION AND TO THE CALCUTTA WATER SUP-  
PLY.—By D. WALDIE, ESQ.

(Received Oct. 29th ; read Nov. 5th, 1873.)

CONTENTS.

- I.—Introduction,—construction of the Filters at Palta, difficulties in their working—question as to the cause of this,—true cause, according to the author, is the peculiar nature of the water.
- II.—Desirableness of explaining the reason of this peculiarity,—considerations which led to its discovery,—its nature,—experimental evidence in proof.
- III.—Corroborative evidence from other sources, direct and indirect.
- IV.—Details of experiments connected with it and results.
- V.—Further corroborative evidence and additional explanatory remarks.

I.—The works for the supply of Calcutta with water have been in operation since the early part of 1870. The nature and arrangement of the filtering materials in the filtering tanks at Palta were decided upon chiefly from the results and conclusions to which I came after a series of experiments made during the rainy seasons of 1868 and 1869, for the purpose of ascertaining what was likely to be most suitable and efficacious for filtering the muddy water of the Hugli during the floods that extend from June to September or October annually. These experiments also included an examination of the value of a particular contrivance called Spencer's Regulating Cup, to which great importance was attached by the Engineer who designed the works. The general conclusions to which I came were, that this Regulating Cup possessed no *special* value, for that the retardation of the flow of water which was stated to be its particular function could be attained equally well or better by other means ; and that the better sand of the two kinds submitted to me for comparison was the fine sand from the sand-bank in the river, which, as it could be obtained on the spot, was called Palta sand. The other sand, called Magra sand from the locality at which it was found, was considerably coarser in grain, and was stated to be more like that used for filters in England. Though well enough aware of this, I decidedly preferred the Palta sand for filtering the muddy water of the rains, which was the period of special difficulty. For the remainder of the year, I considered it of little importance which kind of sand should be used.

In accordance with my recommendation, the filters were fitted up with Palta sand and without the regulating cups. They worked well during the first rainy season ; but afterwards, particularly during last season (1872), there was so much difficulty in getting water filtered through them sufficiently

clear, and in the required quantity, owing to the largely increased demand, that they were pronounced a failure by the Superintending-Engineer, who advocated a trial of the coarser sand combined with the Regulating Cup, with, as he said, assurance of success, and in the view of adapting this arrangement to the whole eight filters if found satisfactory.

No more complete condemnation of the arrangements I had recommended could well have been made. Reasons were given for it, of which I need only state the principal. The Palta sand was too fine, and consequently rapidly became choked up; such sand was not used in England. It was a principle laid down by Engineers that the muddy particles should not penetrate more than an inch or two below the surface of the sand; this was not the case here, as they penetrated deep into the sand, and made it foul throughout. The fine sand retarded the flow of water too much, and speedily became choked up by the deposition of mud; the proper retardation and regulation of the flow should be effected from below, either by a greater depth of coarser materials, or by the use of the Regulating Cup.

My replies to these reasons were that the fine sand was not too fine for the water which was to be filtered, and that if not used in England, neither was such water filtered in England. This mud of the Hugli water during the rainy season could not be prevented from penetrating deep into the sand, at least if the water were to pass at such rate as would be practically of use; that the choking up of the sand to a certain extent, instead of being an objection, was essential to its proper action as a filter for this water, and the object should be not to prevent but to regulate it,—and that it could be prevented neither by a greater thickness of coarse material nor by regulating cups. And, further, that the difficulty and consequent great amount of labour and trouble in filtering the water during the rainy season was caused, not by the particular arrangement or nature of the filtering materials but by the nature of the water itself; and, consequently, that the proposed remedy was entirely delusive, and would certainly fail.

Though no formal opposition, so far as I am aware, has ever been made to my statements or opinion respecting the quality of the water, neither has the conclusion been formally admitted as correct, and it has been overlooked or neglected in all reasoning on the subject, at least as a sufficient explanation of the difficulty. The principles of sand-filtration were appealed to, and these were explained to depend chiefly on the attractive power of the coarser particles of sand for the finer particles of the mud suspended in the water; and this was represented as the most important part of the process,—“such *is*, in fact, filtration,”—apparently almost to the exclusion of what was called mere straining. This explanation I hold to be totally erroneous. The most important part of the process is straining, the prevention of the passage of particles through narrow crevices between the grains of sand; next is depo-

sition by gravity, on the upper surface of these granules, of still finer particles;\* and last, and least important of all, is the mutual attraction of particles of mud and sand independent of gravity. The influence of all of these processes will be affected by the greater or smaller size of the particles of mud in suspension, and the difficulty in getting the water to pass clear will be the greater the smaller the particles are. Hence the great difficulty with the water in question, the particles being so very fine.

II.—The peculiarity of the Hugli water from June to October I had always connected with the tropical rains and melting of the snows at the sources of the Ganges, occurring together so as to form one great flood of four or five months duration, instead of occasional floods to which rivers of European countries are subject, exceeding these greatly both in amount and in duration. I had not, however, been able to offer any other than conjectural explanations of its slowness in clearing by settling and of the difficulty in filtering it, of which I had found abundant evidence as a matter of fact. Attention having been again directed toward the subject by the circumstances previously referred to, I was led again to think of the advantage it would give me to be able to state some reason for my belief that the cause of difficulty lay in the nature of the water; some explanation of this peculiarity,—a reason why it should be so,—some generalisation shewing that it was not an isolated fact, but one of other similar facts admitted and acknowledged. Indeed, ever since it had been so forcibly brought under my own notice by my filtration experiments, and fixed in my own mind at least as a certainty, I had been alive to everything, old and new, that appeared to have a bearing on the subject, whether it were practicable means of purifying the water or a way of explaining the difficulty.

With respect to purifying muddy water generally there were certain methods which were well known and others less generally. The use of alum and other salts of alumina for such a purpose had long been known: salts of peroxide of iron, a substance chemically having much analogy with alumina, had more recently been introduced, and in my opinion they were even superior to salts of alumina. These substances act by the alumina or peroxide of iron being separated from its combination with the acid by alkaline matter which might be added along with them, or by the action of the carbonate of lime present in many waters, or even simply by large dilution, as in this case the base tends to separate from the acid. The alumina or oxide of iron separates in loose soft flakes which envelop or attract the fine particles of the mud, and carry them down with them, leaving the liquid quite clear. Indeed many other substances that produce flocculent precipitates by the addition of another substance have the same effect; thus by adding a solution of sulphate

\* Well illustrated by Wanklyn and Chapman in the 2nd edition of their treatise on *Water Analysis*.

of copper, and then a little soda, oxide of copper is thrown down carrying the mud with it. I have, indeed, made use of this method for precipitating the fine, suspended mud for chemical examination; the oxide of copper being removed from the precipitate, after collection, by ammonia and acetic acid, and the mud washed. This process, when the precipitants are employed in proper quantity, is speedy and convenient.

There is another class of substances which operate in a similar way, namely, alkalies and alkaline earths, such as Soda and Lime. These combine with the carbonic acid that keeps carbonate of lime in solution, which becoming insoluble is consequently precipitated. When Lime is used an additional quantity of carbonate of lime is produced. This, in fact, is Dr. Clark's well-known process for softening such waters as owe their hardness to carbonate of lime in solution. The precipitate formed carries down other matters with it leaving the water clear. The objection to the use of this process is the large quantity of additional sediment produced, and the risk of some prejudicial effect on the quality of the water, at least if not carefully managed.

Another class of substances the mode of action of which is not so evident, is acids. I do not know when this was first noticed. Graham, Miller, and Hofmann in their Report on the London waters, June 1851, speaking of the impurities, refer to "this clay tinge which resists the action of acids." Whether from this hint or not, I do not recollect, but I myself employed acids in 1866 for the purpose of clarifying the muddy waters of the Hugli during the rains.\* A small quantity of Nitric or Hydrochloric acid added to a large bottle of muddy water so altered and precipitated the mud that next day, or even in a few hours, it could be filtered clear with ease. I used alkalies, also, and perchloride of iron; but did not prosecute the subject further, my object having been simply to get the water clear with as little addition of foreign matter as possible; and nothing was better than a little of these acids,—even of acetic acid.

There is yet another class of substances the action of which is equally if not more difficult to explain, namely, those substances usually called neutral salts, both alkaline and earthy. The first direct notice I found of this was in some remarks in the 'Chemical News' of 3rd April, 1868, by Mr. W. Skey, Chemist to the Geological Survey of New Zealand, on the property of this class of substances to clarify muddy water. In this he specifies that 1 grain of common salt clarifies 5 ounces of muddy water and 1 grain of chloride of calcium or barium 10 ounces, 1 grain of lime 15 ounces and 1 grain of sulphuric acid 50 ounces. He thinks that these substances must act solely from their affinities for water, as it is not at all likely that they undergo any decomposition themselves. In the 'Chemical News' of 8th

\* Journ. As. Soc. Beng., 1867, Vol. XXXVI, Pt. II, p. 7.



July, 1870, is a short abstract from the 'Comptes Rendus' of the Academy of Sciences, of 20th June 1870, of a paper by Dr. C. Schloesing on the same subject, in which, it is stated, he refers to river waters contaminated with clay being readily clarified by 1000th part of chloride of calcium or other salts of lime, and being then readily filtered, while previously they rapidly choked the filter. He refers to several rivers, such as the Rhine in its lower course and the Durance which supplies Marseilles, as being notorious for this peculiarity. Then in the same Journal of 12th May, 1871, Mr. Skey notices this as a re-discovery on the part of Schloesing, and says that 1 grain of chloride of calcium is sufficient for 10 ounces of muddy water or 50,000 grains, an evident misprint for 5000 grains. He also notices a paper on the so-called molecular movements of microscopic particles by Professor Jevons, who has some theory about this coagulation of clay being due to the water becoming by such addition a conductor of electricity, and the clay particles charged with electricity.

Besides all these direct observations, there is a phenomenon which had long (long before these observations were made) come under the observation of chemists in filtering and washing certain precipitates and sediments, namely, that for a time, while there is saline matter present in solution, the filtered liquid comes clear, but when, by continuing to wash such substances by distilled water, these saline matters become much reduced in quantity, then the filtered liquid flows muddy, the solid substance passing in a state of very fine division through the pores of the filtering paper. The chemist to avoid this adds a proportion of some saline substance (such as chloride of ammonium or muriate of ammonia) which will not interfere with his subsequent proceedings, and so is enabled to wash the sediment or precipitate free from everything except the substance which he has added. He can get rid of this afterwards by other means if it be necessary. This peculiarity especially occurs with clays and substances more or less analagous to them, such as Zirconia and Titanic acid. Another illustration is given when we attempt to extract the saline matters soluble in water from clayey soils. When the soil is first mixed with distilled water and allowed to settle, the supernatant liquor may be clear: if this be poured off and more distilled water be mixed with the residue, it will not settle and clear so readily, and if the process be repeated, it may take a very long time to do so. Just in proportion as the saline matter is removed, the fine clay separates with greater difficulty from the pure water.

It is to be observed that the substances here referred to, namely, neutral salts, are just the same sort of matter that exists in natural waters in small quantity. Reflecting on the difficulty, with the impression of the above-mentioned facts on my mind, on or about the 1st August last, the question occurred to me: How small a quantity of such substances is sufficient



so to change the character of the mud in the river water of the rains as to enable it to settle with sufficient readiness, and in such a state as to render the water capable of being filtered without difficulty? Will the difference of quantity between that of the saline matter which exists in the water of the rainy season and that, say, of December be sufficient? Will the addition of such small quantity of the same kind of saline matter that exists in the river water to the water of the rainy season, so change its character that these difficulties in settling and filtering will be removed? Without delay a few experiments were instituted and their results observed, and these results shewed that the question was solved in the affirmative and the whole difficulty cleared up. The Hugli water during the rains contains too much pure water in proportion to its saline constituents, or these natural precipitants are present in too small quantity to precipitate the mud, as they do in other localities which have no tropical rainfall to produce so great dilution. And now my previous conviction as to the cause of the peculiarity was at once confirmed and explained.\*

The first experiment was made by means which came at once to hand. One quarter of a litre of muddy water from the river was mixed in a bottle with an equal volume of water from a tank which, in the dry season, I had found to contain a considerable quantity of saline constituents. Now, from the rains, I knew that it must be considerably more diluted, nevertheless not so diluted as the river water. In another bottle, for comparison, was mixed an equal quantity of the river water with the same volume of distilled water. It seemed natural to think that this mixture with distilled water would settle most speedily, more particularly as the tank water contained much glutinous vegetable matter; nevertheless, notwithstanding this disadvantage, the mixture with the tank water settled best. It was not a very good experiment, yet the result was quite distinct.

Then solutions of sodium and of calcium chloride (common salt and muriate of lime) were prepared of known strengths. The amount of saline constituents in the river water during the rainy season was pretty well known from former analyses, and these solutions were added in such quantity as approximately to double the quantity of saline constituents in the water, and thus bring it near the composition of the river water of December as regards alkaline and earthy salts. This produced an improvement in the settling, very slight in the case of common salt, very decided in that of chloride of calcium (muriate of lime). This at once shewed, what was afterwards abundantly confirmed, that lime salts were much more efficacious than alkaline salts. I shall return to this part of the subject further on.

\* At the meeting of the Society on 4th August last I intimated that I had discovered what I believed to be the true explanation of the difficulty with the water. *Vide Proceedings for August, 1873.*

Another obvious-looking plan was to dry a measured portion of the water and add its solid constituents to an equal quantity of water, so as to double the total amount. But there were practical difficulties in this process, in the changes the constituents would undergo by evaporation; it was, however, done thus: a portion of filtered water from the Calcutta hydrants was concentrated by evaporation over the water-bath to one-fifth of its volume; after this carbonic acid gas was passed through the concentrated liquor in order to redissolve the carbonates of lime and magnesia which had separated. One volume of this concentrated water was now mixed with four volumes of muddy river water, so as to make up the original quantity. This mixture, on being allowed to stand, settled well and the water could be filtered easily. In all cases a similar bottle of the muddy water, unmixed with anything, was placed beside these mixed waters for comparison.

In all the above experiments the waters were allowed to stand 24 or 48 hours to settle. This was a point I had calculated on, as the object was not to clarify the waters as rapidly as possible, but to imitate the settling and clearing of other natural waters or of the Hugli water itself during the dry season, by assimilating its composition so far as regards soluble salts to that of those.

III.—I have examined the tables given in Bischoff's *Chemical Geology*\* of the composition of various river waters for anything to be found bearing on this subject, and the author's remarks connected with rivers. The varieties of composition are obvious, and a few rivers are to be found containing but a small quantity of saline constituents and particularly of earthy salts in their waters. In a few cases the composition is given at different localities or at different periods of the year, but generally there is not enough of information to connect these facts with the subject under consideration. Two analyses of the Rhine water at Basle and at Strasbourg shew fully 14 parts of Carbonate of Lime and Magnesia in 100,000: again at Bonn in March, 1852, there are fully 10 parts; in March, 1857, only  $4\frac{1}{2}$  parts; but in the former case the river was very low and of the usual clearness, in the latter it was much swollen and very turbid. Bischoff has a chapter on mechanical deposits from water, in which he notices various particulars respecting rivers. Of torrents which issue from glaciers, he says, all of them roll along in a turbid grey milky or dark stream according to the nature of the pulverized rock. Generally speaking, in rivers, the quantity of suspended matter increases with the height of the water, and the substances dissolved diminish. The suspended matter consists generally of clay, but in limestone districts it may consist partly or chiefly of carbonate of lime itself. Of course even water containing a considerable quantity of soluble salts of lime may be muddy, but if the mud consist of clay, the mud

\* *Cavendish Society's Trans.*, 1854.

will settle readily by repose. If the suspended matter in such waters consist partly or chiefly of carbonate of lime, how it will be affected by the soluble salts present I am not prepared to say, as I have had no opportunity of examining such waters. A French author, whom I shall quote presently, speaks of waters which are never clarified entirely by repose; such are, as he calls them, "*les eaux blanches de Versailles*," which owe their milky tint to their contact with layers of calcareous marl. Whether these waters contain soluble salts of lime or not, I do not know.

In a note to the chapter referred to, Bischoff mentions that Th. Scheerer\* had found that "the deposition of suspended matter is hastened when certain salts—alum, sulphates of copper and iron—are dissolved in the water. "But since a solution of chloride of sodium behaves like pure water, it cannot be expected that the suspended matter is deposited more quickly in "the sea than in rivers." Now here is a mistake, for solution of chloride of sodium does not behave like pure water. Mr. Skey, more correctly, thinks that the transparency of the sea may depend on the precipitation of mud by the saline matter. Scheerer's observations must I think have been too hastily or imperfectly made.

The French works just referred to,† very valuable no doubt for what they were intended, principally engineering, did not, however, contain much of the sort of information I was in search of. That by Darcy gave me some worth noticing. It contains accounts of the filtering operations at Chelsea, Southwark, Thames Ditton, York, Hull, Paisley, Glasgow and Marseilles, also of the natural filters of Nottingham, Perth, Toulouse and Lyons. The natural filters are out of the range of the present enquiry, the first four appear to be on a similar plan to those at Palta, the latter three are different in their arrangements for cleaning the sand. Those of Gorbals, Glasgow, are not sufficiently well described, those of Paisley are; in both the clearing is effected by passing the water from below upwards, but, as the nature of the water is not at all likely to have any analogy with the water under consideration, I need not notice them. The filters at Marseilles, however, are worthy of a little attention. The water which supplies Marseilles is derived from the Durance. This water, as well as that of the Rhone, judging from the description, must have a considerable similarity to that of the Hugli during the rains, at least during certain periods, requiring a long time to settle and become clear. From some things stated in the account of the filtering operations, however, I do not think that the particles of the sus-

\* In Poggenдорff's Annalen, Vol. 82, p 419, date unknown but previous to 1854.

† *Traité de la conduite et la distribution des eaux*, par J Dupuit, Paris, 1854 and *Les Fontaines publiques de la ville de Dijon* par Henry Darcy, Paris, 1856, both beautifully illustrated by plates. For inspection of these I have to thank Dr Tonnerre, Health Officer to the Municipality.

pended mud can be so very fine as those of the water of the Hugli during the rainy season. There are unfortunately no analyses, but as they come from Alpine regions they must be often diluted with much pure water from melted snow.

The whole thickness of the bed of filtering materials is only .8 metre or about 2 feet 8 inches, of which the upper layer is .3 metre or about 12 inches, consisting of very fine sand (*Sable très fin de Montredon*), below which are layers of middling and coarse sand, gravel and broken stones. It is stated that the filters might work more than eight or ten days, but if kept going longer they would be more difficult to clean. This cleaning is effected by passing the water backwards and upwards through the sand, the impure water being carried off from the surface by channels for the purpose. I have to observe that here we have filter beds much thinner than those at Palta, very fine sand and upward charging, all points that have been considered objectionable for the Palta filters. The cleaning by upward charging requires considerable velocity of current and a continuance of it for four or five hours of time. I have calculated from the data given that it would require about 14 or 15 feet of perpendicular height of water, that is, about as much water as one of the filter tanks, emptied of its filtering materials, would hold two and a half times. No account is given as to how it is done, but I concluded that the level of the canal from which the water is supplied to the filters must be sufficiently high for the purpose.\*

I can also bring confirmatory evidence of another kind from English waters, evidence to shew why these waters are not attended with such difficulties in their filtration. There are no circumstances to produce such muddy waters as are to be found even on the European continent, no Alps and glaciers to produce this muddy water even at its source, no mountain snows to melt, and no large falls of rain concentrated in one period. I refer to a paper by Dr. Frankland† on the water supply of the Metropolis during the year 1865-66. In this paper there are several tables of the principal constituents of the water of nine Water Companies for every month of the year. These tables shew that the amount of saline constituents varies during the year, but never to near such an extent as that of the Hugli: they also shew that the earthy salts vary in their amount as indicated by the hardness, but never become reduced to nearly the same degree as those of the Hugli, being at their lowest indeed nearly as much in amount as those of the Hugli in December or January. The variation of course depends upon the rainfall, but this does not vary as respects either quantity or time in the same

\* I have since been informed by Dr. Tonnerre that the level of the canal is high above the town.

† Journ. Chemical Society, 1866, Vol. XIX, p. 239.

way as it does in the valley and the source of the Ganges ; in England the rainfall and hardness both rise and fall repeatedly during the year. The case is entirely different from the state of matters here in which we have a very soft water from the commencement of the regular rains gradually becoming harder in November and December and continuing so till the rains set in again in the following year. There is no reason, therefore, to expect any noticeable disturbance in the conditions of filtration in England from change in the condition or nature of the water, but every reason to expect it here, if we can only suppose or admit that such a change in the water *may* affect the filtration. And I would ask, why we should not admit that it should do so? My experience convinced me that it did so affect the filtration, and though I could not satisfactorily account for it or explain how it did so, I continued firmly to maintain that it did so, that this was the true cause of the difficulties, and that consequently other explanations were fallacious and baseless.

I should have been glad to have found other corroborative evidence of the correctness of my opinions, but had no means of obtaining it. Fortunately the discovery of the nature of the peculiarity rendered this of comparatively small importance. I return now to the consideration of this subject a little more in detail.

IV.—After ascertaining that such a very small quantity of lime salts or rather of chloride of calcium, for that was the salt experimented with at first, was sufficient for the purpose required, I proceeded to compare the efficiency of different neutral salts. For this purpose I had to choose a standard of comparison, and as the enquiry related at present to the Hugli water, I chose it with reference to the composition of this. Chloride of Sodium or common salt might have been taken, but I found its effect comparatively so small that I gave that up. The really influential constituents in the river water were the salts of lime and magnesia, particularly the carbonates, and as I found that these were of nearly equal power, I decided to take that which existed in largest quantity, namely carbonate of lime, as the standard of comparison. But as a solution of carbonate of lime in excess of carbonic acid is troublesome to prepare, its strength somewhat troublesome to ascertain, the solution itself weak, consequently involving the addition of a notable quantity of water, besides being liable to change, I chose for my working standard a solution of chloride of calcium equivalent in strength to 1 grain carbonate of lime in 50 cubic centimetres of solution, equal to 1.11 gm. chloride of calcium in 50 c. c. This formed a convenient strength for measuring by a pipette. For the composition of the water, I assumed that during the rainy season it contained salts of Lime and Magnesia equivalent altogether to 7 grains of carbonate of lime in 100,000 flin. or .07 gramme in 1 litre. This is equal to 4.9 grains in 1 gallon. Perhaps it is rather too

low an estimate, 8 grains or even 9 grains to 100,000 being possibly more correct.

A question soon arose as to what was the general nature of the action, for on that I must regulate the plan on which I was to compare different substances. I have quoted Professor Jevons's electrical theory about the coagulation of clay, which is too speculative for practical application,—also Mr. Skey's, that these precipitating substances must act solely from their affinity for water, because the powerful affinities of the component parts of most of these substances precluded the idea of their decomposition. The general tendency of the experiments I made at first, however, led me to reject this explanation, and to conclude that the action was most probably a chemical one, though it might be difficult, or at present impossible, to explain exactly how it operated. In consequence of this I decided to compare, not absolute weights of the different substances, but their chemical equivalents. Reasons for this conclusion will be given presently.

I generally operated on half a litre of water. This was mixed with the substance to be tried and allowed to stand from 24 to 48 hours. A row of such bottles with different substances was placed on the table with one bottle containing unmixed water, and comparison was made of their respective appearances at the end of a certain time, sometimes of two or three times, and the result noted. Different proportions of the same substance were compared in the same way. The conclusions were drawn only from the experiments made on the same water at the same time, not between different samples of water or between observations made at different times.

The substances compared were chiefly, but not exclusively, those found in natural waters. They may be divided into the following classes:—

Alkalies and alkaline earths.

Acids, or Hydrogen salts.

Neutral salts of the alkalies.

Salts of Lime and Magnesia,—or of alkaline earths generally.

Salts of protoxides of heavy metals, namely of Iron, Manganese and [Copper.

Salts of the sesquioxides,—namely of Aluminum and of Iron.

The range might have been considerably extended, and the series have been more complete, but I could not spare the time necessary for a more numerous series; besides, the river water began to improve about the end of August and continued to do so, as the rains ceased early. The experiments, however, were sufficiently numerous to enable me to draw conclusions of interest.

I shall arrange the substances tried in a tabular form, attaching to them numbers indicating the number of chemical equivalents necessary to produce the same effect as Carbonate of Lime in solution in carbonic acid water. The



equivalents will be in relation to the atomic weight of chlorine 35·5; thus,—combined with Sodium 23, Calcium 20, Iron (Ferrosium) 28, (Ferricum) 18·66, forming Sodium Chloride 58·5, Calcium Chloride 55·5, Ferrous Chloride 63·5, Ferric Chloride 54·16, so that equivalents can easily be converted into absolute weights by multiplying by these numbers, and to facilitate this the equivalent numbers are given. The absolute weights are also given in the last column which, it will be observed, are the products of the two first multiplied by 2 to bring them to the standard of Carbonate of Lime taken as 100, the double of its equivalent. The equivalents and absolute weights, also, are all for the substances free from water of combination, crystallization or solution.

*Table of approximate quantities required to produce an equal effect in clarifying the muddy water :—*

|                                                           | Chemical<br>equivalent. | Number of<br>equivalents. | Absolute<br>weight. |
|-----------------------------------------------------------|-------------------------|---------------------------|---------------------|
| Chloride of Sodium or Common Salt, .....                  | 58·5                    | 40·0                      | 4680                |
| Potassa Hydrate, .....                                    | 56·0                    | 5·0                       | 560                 |
| Soda Bicarbonate, .....                                   | 84·0                    | 4·0                       | 672                 |
| Acetic Acid, .....                                        | 60·0                    | 3·0                       | 360                 |
| Sulphuric Acid, .....                                     | 49·0                    | 2·0                       | 196                 |
| Calcium Chloride, or Muriate of Lime, ...                 | 55·5                    | 2·0                       | 222                 |
| Magnesium Chloride, or Muriate of Magnesia, .....         | 45·5                    | 2·0                       | 182                 |
| Nitric Acid, .....                                        | 63·0                    | 1·5                       | 189                 |
| Barium Chloride, .....                                    | 104·0                   | 1·0                       | 208                 |
| Carbonate of Lime, dissolved by Carbonic Acid, .....      | 50·0                    | 1·0                       | 100                 |
| Carbonate of Magnesia, dissolved by Carbonic Acid, .....  | 42·0                    | 1·0                       | 84                  |
| Sulphate of Lime, .....                                   | 68·0                    | 1·0                       | 136                 |
| Sulphate of Manganese, .....                              | 75·5                    | ·5                        | 75·5                |
| Sulphate of Copper, .....                                 | 79·5                    | ·2                        | 31·8                |
| Protosulphate of Iron, .....                              | 76·0                    | ·15                       | 22·8                |
| Protocarbonate of Iron, dissolved by Carbonic Acid, ..... | 58·0                    | ·15                       | 17·4                |
| Alum, .....                                               | 79·2                    | ·05                       | 7·92                |
| Aluminum Chloride, ..                                     | 44·8                    | ·05                       | 4·48                |
| Perechloride of Iron, .....                               | 54·7                    | ·025                      | 2·74                |

Chloride of Potassium or Muriate of Potassa, Sulphate of Potassa, Acetate of Potassa and Phosphate of Soda were about equally efficacious with common salt.

This table shews the very great difference in efficiency between different substances, common salt having only one-fortieth part of the power of the standard Carbonate of Lime when chemical equivalents are compared, or about one-forty-seventh part when actual weights are compared. On the other hand, Perchloride of Iron is forty times as powerful as Carbonate of Lime, chemical equivalents being compared, or about thirty-six times when actual weights are taken.

A glance at the table will shew that the precipitating power is just in proportion to the facility with which the acid and basic constituent of the salt can separate. The alkalies and alkaline earths ought to be excluded as they exert a chemical change in the soluble constituents of the waters, but it appears to me pretty evident that both the acid and basic constituents of the remainder of these substances take part in the effect produced on the clay. Acids themselves do so, as shewn by the table, even so very weak a one as Carbonic acid gas does so when passed for sometime through the muddy water, as I found from direct experiment. And I also found that when using these small quantities of alumina, the addition of a proportion of potash, more or less, to neutralize the acid constituent of the salt was no improvement but the reverse. Pieces of sheet iron, immersed in a bottle of muddy water and shaken occasionally, in a few hours caused the mud to precipitate very well; the iron evidently had been acted on by the Carbonic acid in the water and the atmospheric oxygen to form a small quantity of a salt of iron which produced the effect.

The numbers in the table are by no means to be taken as accurately ascertained. The shortness of the period during which muddy water of nearly similar quality was available rendered this impossible. After the end of August, I employed water from the river mixed in a vessel with the mud deposited from previous water and stirred up, which can scarcely be taken as a very good representative of the water during the worst period of the rains, though probably good enough for the purpose, as the comparisons between different substances were always made with the same water. But as the month of August was chiefly occupied with experiments on the natural constituents of the water, namely alkaline and earthy salts, and those on the effects of the salts of the heavy metals and of the sesquioxides were not made till September when the water had undergone some change, the numbers given for these latter are not quite so certain, possibly may be stated as smaller than they would have been had the August water been used. The decision on this point must be reserved for next rainy season.

It may be well also to state the absolute quantities of these or at least of some of these substances that would be necessary to clarify a given quantity of the muddy water, calculated from the data given. For this purpose the standard will be Carbonate of Lime, dissolved by Carbonic acid, in the



proportion of .07 gramme to 1 litre or 1000 cub. centimetres or 7 pounds to 100,000 pounds of water, which is equal to 700 pounds to 10 million pounds of water or to 1 million gallons. From this the quantity of any other of the substances given in the table may be calculated from the last column by simple proportion. Thus as 100 Carbonate of Lime is to 700 pounds required, so is 136 Sulphate of Lime to 952 pounds required, or 2.74 Perchloride of Iron to 19.18 pounds required for 1 million gallons of the muddy water of the Hugli.

It is necessary to remember, however, that the table given refers to the dry substances, which is the natural condition in which they are usually found in only a few of the substances enumerated in the table, such as Common Salt and Carbonate of Lime. Most of the other substances contain water of crystallization or water of solution, which last may be a very variable quantity. In the latter case the quantity of dry matter in solution must be known. The following table includes a few of the preceding substances most likely to be of practical application :—

*Table of absolute quantities of substances necessary for the clarification of 1 million gallons of muddy water of the Hugli during the rainy season, calculated from the data given above.*

|                                                                    | Pounds. |
|--------------------------------------------------------------------|---------|
| Common Salt, dry, equiv. 58.5, .....                               | 32,760  |
| Chloride of Calcium or Muriate of Lime, fused or dry, eq. 55.5, .. | 1554    |
| Carbonate of Lime, dry, eq. 50, .....                              | 700     |
| Gypsum or native cryst. Sulphate of Lime, eq. 86, .....            | 1204    |
| Sulphate of Iron cryst., eq. 139, .....                            | 159.6   |
| Alum cryst., eq. 151.2, .....                                      | 55.4    |
| Perchloride of Iron, dry, 54.7 .....                               | 19.15   |

It may be also worth noting the proportion of a few of these substances to the water, on the above data.

|                             |      |         |
|-----------------------------|------|---------|
| Common Salt, .....          | 1 to | 305     |
| Gypsum, .....               | 1 to | 8,306   |
| Carbonate of Lime, .....    | 1 to | 14,286  |
| Perchloride of Iron,* ..... | 1 to | 522,000 |

These numbers shew that chloride of calcium is nearly twenty-three times as effective as common salt. Skey estimated it as only twice as effective. Schloesing, as will be stated immediately, estimated chloride of potassium as of only one-fifth of the efficacy of lime salts and chloride of sodium

\* On referring to my Note Book I find that in July 1866, I had come to the conclusion that about 1 of Perchloride of Iron is sufficient to precipitate the mud from 125,000 of water by standing over night, an approximation at least to the small quantity I have recently found to be sufficient. This was when I was not thinking of its application on the large scale nor searching for a minimum.

weaker still. It will be observed that my numbers differ widely from theirs. The differences are to be accounted for, partly from the circumstance that my examinations have been pushed further than theirs, thus shewing that one lime salt is twice as efficacious as another, that some other salts are far more powerful than lime salts, and that the salts of the heavy metals and particularly of the sesquioxides seem to act on the same principle, which does not appear to have been suspected by either Skey or Schloesing, at least is not alluded to. It is also probably partly due to the differences of the mud operated on, both as respects the composition of the insoluble matter it chiefly consists of, as well as of the soluble matter that it may contain.

V.—I had written thus far when I had an opportunity of seeing Schloesing's paper in the original, in the *Comptes Rendus*, and found it much more complete and interesting than I could have concluded from the brief abstract in the *Chemical News*. He was first led to notice the peculiarity from a circumstance I have mentioned before, namely the treatment of argillaceous soils with distilled water. He not only mentions that distilled water rendered muddy by a mixture of purified fat clay is precipitated by 1-1,000th part of lime salts immediately, but that this is the case also by 1-5,000th part in some minutes and by 1-50,000th part in two or three days. He refers to the muddy water of the Seine becoming limpid in an hour or two by a very small addition of a lime salt, but at the same time states that the Seine water contains 89 milligrammes of lime per litre, equal to 8.9 parts in 100,000 or 15.9 of Carbonate of Lime, a much larger quantity than that which exists in the Hugli water during the rainy season, indeed nearly as much as is found in December and January. Schloesing further directs attention to the influence of this peculiarity on clay soils and on what is called the mechanical analysis of soils; and he further notices the precipitation of mud so carried in rivers by the water of the sea, and also the practical applications suggested by it for clearing muddy water. Indeed he concludes by a reference to the waters of the Durance employed for supplying Marseilles, tracing the muddiness of such waters to their sudden dilution with large quantities of pure water and suggesting a remedy in the restoration of the water to its normal condition by the addition of lime salts or an admixture of some other water containing abundance of these; in complete accordance with all I have been contending for. Schloesing states that Magnesia salts are about equally efficacious with Lime salts, and that salts of Potash are required in about five times the quantity that lime salts are, and that soda salts are still less active. He refers to no other classes of salts, but speaks of Carbonic acid as producing the same effect, attributing its efficacy to the solution of Carbonate of Lime present in the insoluble state.

This idea had occurred to myself, and that also it might explain the

action of the other stronger acids. I am not prepared at present either to admit or deny this. To settle the point would require experiments to be made in which the sources or causes of doubt should be removed. Though it might be supposed that these acids dissolve a small quantity of the otherwise insoluble carbonate of lime, this does not account satisfactorily for the circumstance that the salts of the sesquioxides of aluminum and iron and even of the protoxides of the heavy metals are so much more efficient than lime salts themselves.

I found in another number of the Chemical News, that of 14th May, 1869, an abstract of a "Report of the Netherlands Committee." This committee, evidently, (though particulars are not stated), consisted of a body of scientific men examining the waters of certain rivers with a view to their economical use, the Rhine and Maas being particularly mentioned. So far as I can judge from some particulars mentioned, these waters do not appear to be exactly similar to the muddy water of the Hugli. The committee especially recommend Perchloride of Iron for the purification of such turbid waters, along with Carbonate of Soda, and recommend .032 grains Perchloride of Iron for 1 litre which is equal to 1 part for 31,250. I have given it as 1 to 522,000 and without soda. It is obvious that the question of quantity is very important in the application of this artificial method of clarifying muddy water with a view to economy. The great expense, evident in the application of all proportions known before, was one cause that prevented me from giving the subject much attention, as I had adverted to the use of precipitants as far back as 1867, in my paper in this Journal.\*

One way and the best of all ways of restoring the proper quantity of Lime salts to such water would be to bring it thoroughly in contact with Carbonate of Lime, provided it contained enough of free Carbonic acid to dissolve a sufficient quantity. But this is very doubtful and not very likely in ordinary waters. Experiment shewed only a small improvement.

Both Skey and Schloesing state that the chief point seems to be that there should be a certain quantity of the precipitating substance in proportion to the water, and that the quantity of clay present does not make much difference, Schloesing remarking even that the limpidity is more perfect when the mud attains a certain proportion, just as I have myself found that the muddy Hugli water settled and cleared better by adding some dry soil to it, this of course from the soluble matters contained in that soil. The general point, however, I had not time to examine, my attention having been given to the Hugli water as it presented itself in nature.

Both Skey and Schloesing also describe the effect produced by the term coagulation, and it seems quite appropriate. The very fine particles coalesce as it were into larger and comparatively flocculent ones.

\* Vol. XXXVI, Part II, p. 138.

I was not content with these small experiments but tried the process by clarifying the water first by such small proportions of these precipitants, settling one or two days and then passing through a sand filter, and found it to answer perfectly, the filtration going on easily and rapidly. The apparatus was small, the precipitating vessel holding about 45 gallons, the filter being a Zinc tube of about six inches diameter. There were two filters, one with Palta and one with Magra sand: the Palta sand filtered best as I used as small a quantity as possible of the precipitating substances. I could not try it on a larger scale, as my premises are now no longer on the bank of the river. But there cannot in my opinion be the smallest doubt but that the process would answer admirably on the large scale.

My former experiments, at least in my own judgment, proved that the Hugli water during the rainy season could not be filtered without unusual difficulty, and that arising from a peculiarity in the water which I connected with the peculiar distribution of the rainfall in this country, though I could not then explain the cause:—it was a matter of fact whether it could be explained or not. Plans proposed to overcome this difficulty, supported by experience of water filtration in England, I declared would be useless, because the water was different and English experience therefore not applicable.

One special contrivance, which it was alleged would be effective for the purpose, I had tried, and had given my opinion that it was worthless for the purpose. The best plan for filtering the water of the rainy season as it presents itself in nature, I concluded, would be by the use of the Palta sand, properly managed, which includes a proper relation between the amount of filtering surface and the quantity of water to be filtered. All of these statements and opinions I still adhere to, as they were conclusions drawn from the observation of facts, the highest and only true authority from which scientific conclusions can be drawn.

A new idea has supplied me with the means of explaining the nature of the peculiarity, and that not by superseding but by confirming the correctness of my previous conclusions that it was connected with the tropical rainfall, and that was by producing extreme dilution of the water. It also indicated a way to remedy the difficulty of settling and filtering the water. The evidence has been given in the preceding pages, and is founded also on the authority of experimental facts open to scrutiny and criticism. The conclusions, it appears to me, may be of value not only with reference to the Calcutta water supply, but to the purification of water in cases where the circumstances are similar, occurring more generally in tropical countries, but even occasionally in other localities.

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## NEW BURMESE PLANTS, PART III.—By S. KURZ, Esq.

[Received Dec. 5th.]

[With Plates XVIII &amp; XIX.]

## CAPPARIDÆ.

## 227. CAPPARIS CRASSIFOLIA, nov. sp.

Frutex scandens, spinis brevibus recurvatis armatus, novellis et foliis junioribus subtus tomento minuto canescente obtectis; folia obovalia ad obovata, petiolo  $\frac{1}{2}$ — $\frac{3}{4}$  poll. dum juvenili canescenti-puberulo suffulta, basi magis minusve acuta, apice rotundata et brevissime recurvato-acuta, coriacea c. 2 pollicaria, glabra, nervis crassis subtus conspicuis et præsertim basin versus egredientibus; flores solitarii, iis *C. horridæ* subconformes, pedicello  $\frac{1}{2}$  ad  $\frac{3}{4}$  poll. canescenti-tomentoso suffulti; sepala et petala ferrugineo-lanata; filamenta numerosa, glabra; gynophorum longum et ovarium globosum glabra.—Prome.—*C. horridæ* arcte affinis.

## 228. CAPPARIS POLYMORPHA, nov. sp.

Frutex scandens, glauco-viridis, ramis ramulisque tenuiter albescenti-farinoso-tomentosis, spinis brevibus curvis puberulis armatus; folia (juniora valde elongato-rhomboidea) rhomboideo-ovata ad obovato-rhomboidea, petiolo  $\frac{1}{2}$  poll. albescenti-puberulo suffulta, basi obtusa, subcoriacea, obtusa, glauca, subtus et dum juvenilia utrinque, fugaci-albo-puberula, nervis crassis et præsertim basin versus egredientibus; flores solitarii, axillares, iis *C. horridæ* simillimi, pedicello  $\frac{1}{2}$ — $\frac{2}{3}$  poll. canescenti- et pro parte ferrugineo-tomentoso crasso suffulti; sepala et petala ferrugineo-lanata; filamenta numerosa, glabra; gynophorum gracile, glabrum; ovarium glabrum; baccæ (immaturæ) cerasi magnitudine, oblongæ, læves, polyspermæ.—Prome.—Ex affinitate *C. horridæ*. *C. horrida*, *crassifolia* et *polymorpha*, species inter se valde affines, habitu longe distant et sæpius in eodem solo sociatim crescunt.

## MALVACEÆ.

## 229. DECASCHISTIA CRASSIUSCULA, nov. sp.

Frutex humilis, ramosus, dense albido-tomentosus; folia ovata, in petiolo crasso 2—3 lin. tantum longo decurrentia, 2—3 poll. longa, integra v. sublobata, grosse v. obsolete dentata, utrinque dense, subtus albo-tomentosa; flores sessiles v. subsessiles, 2 poll. fere longi; involucri phylla dense tomentosa, basi bractea longa subulata sustenta; calycis lobi paulum longiores et latiores, tomentosi, crasso-costati; petala stellato-pubescentia, venosa; capsulæ dense tomentosæ.—Prome.—*D. crotonifoliæ* valde affinis, sed differt floribus sessilibus v. subsessilibus, foliis latioribus decurrentibus et petiolo brevissimo.

*STERCULIACEÆ.*230. *STERCULIA ORNATA*, Wall ap. Yoigt. Cat. Hort. Calc. 105.

Arbor decidua, novellis pilis coccineis (in sicco brunneis) sæpius glutinosis tomentosis; liber et lignum album (nec rubrum uti in *St. villosa*); folia lata, 5—7-loba, lobis acuminatis, subtus dense stellato-pubescentia, supra pilis brevibus fasciculatis minutis aspersa; flores majusculi, pedicello  $\frac{1}{2}$ —1 poll. longo suffulti, plerunque ochracei in fundo rubicundi, in paniculas terminales coccineo-tomentosas dispositi; calyx puberulus, semilineam longus, lobis lanceolatis patentibus; gynophorum stellato-tomentosum; ovaria fl. fem. dense hispido-tomentosa; carpella 5—6, setis fragilibus lineam fere longis urentibus dense vestita et glabrescentia, c.  $2\frac{1}{2}$ —3 poll. longa, subcylindrico-lanceolata, incurvato-acuminata, intus dense fulvo-setosa; semina plura, oblonga, atra, lævia.—Pegu, Martaban, Tenasserim.—*St. villosæ* affinis, inter alia indumento carpellorum et floribus jam distincta.

*MALPIGHIACEÆ.*231. *HIPTAGE ARBOREA*, n. sp.

Arbor parva, decidua, 15—20-pedalis, novellis dense albido v. flavido-tomentosis; folia valde variabilia, oblonga et ovato-oblonga ad elliptica et elliptico-lanceolata, 2— $3\frac{1}{2}$  poll. longa, petiolo brevissimo crasso, basi obtusa v. rotundata, subcoriacea, dum juniora dense albido-tomentosa et acuta v. breviter acuminata, dein subfloccosa et apiculata v. rotundata, nervis subtus valde prominentibus; flores lilacini v. albi, in fundo aurei, pedicello medio 1—2-bracteolato longo albido-pubescente basi bracteato suffulti, racemos breviores v. longiores albido-pubescentes axillares formantes; sepala obtusa v. acuta, lanato-pubescentia, 2—3 lin. longa; petala unguiculata, fimbriata, reflexa; carpella magis minusve fulvo-tomentella, glabrescentia, alis plerumque securiformi-emarginatis valde inaequalibus (terminali erecta  $1\frac{1}{2}$ —2 poll. longa, lateralibus patentibus plus quam  $\frac{2}{3}$  brevioribus), costa centrali obsoleta.—Prome, Martaban.—Inter species *Hiptagis* generis extricatu difficillimas hæc statura erecta (non scandente) et cortice crassa suberoso-fissa præstat.

*RUTACEÆ.*

GONOCITRUS, nov. g., Pl. XVIII.

Flores 5-meri (an semper?). Stamina.....Ovarium 3—5-gonum, 3—5-loculare, loculis 2-ovulatis. Bacca coriacea, epulposa, 3—4 angulata. Semina magna, cotyledones carnosæ. Arbuscula spinoso-armata in solo salino rhizophoretorum vicens, foliis simplicibus alternis. Flores solitarii, axillares. Genus distinctissimum sed incomplete cognitum, *Atalantiæ* affine.

232. *G. ANGULATUS* (*Citrus angulatus*, Willd. sp. pl. III. 1426; Rumph. Herb. Amb. 110, t. 32; DC. Prod. I. 540; *Atalantia longispina*



Kurz in Journ. As. Soc. Bengal, 1872 295). Baccæ epulposæ, sed intus succo viscido parco (oleo condensato ?) vestitæ. Flores albi (ex Rumph.).

### LEGUMINOSÆ.

#### 233. CROTALARIA KURZII, Baker MS.

Herba annua, erecta, ramosa, 1—3-pedalis, ramis teretibus parce appresse pubescentibus; folia obovato-ad lato-lanceolata, basi subcuneata, brevissime (1—2 lin.) petiolata, mucronato-acuta v. subcuspidata,  $1\frac{1}{2}$ —3 poll. longa, raro longiora, subtus parce puberula et pallida; flores mediocres, lutei, vexillo extus atropurpureo-striato, pedicello  $\frac{1}{4}$ — $\frac{1}{2}$  poll. pubescente suffulti, vulgo solitarii v. raro bini, hinc inde fasciculatim ex foliorum axillis erumpentes simulque in racemos axillares et terminales parce pubescentes dispositi; bractæ minutæ, subulatæ; calyx semilineam circiter longus, parce appresse puberulus, lobis falcato-lanceolatis acuminatis; corolla calyce longior; legumen  $\frac{3}{4}$  ad  $1\frac{1}{2}$  poll. longum, sessile, basi attenuatum, glabrum; semina pallida v. pallide brunnea, nitentia, lin. lata. Var.  $\alpha$ . genuina, folia minora, 4 poll. non excedentia; legumen  $\frac{3}{4}$ —1 poll. tantum longum et calyce duplo longius; semina pallida, lineam lata.—Pegu, Martaban.—Var.  $\beta$ . luxurians, folia 6 poll. longa; legumen  $1\frac{1}{2}$ —2 poll. longum et calyce 3—4 plo longius; semina brunnea,  $2\frac{1}{2}$  lin. circiter lata. Pegu. Var.  $\beta$ , ejus flores non vidi, cum forma typica, characteribus supra indicatis exceptis, omnino quadrat.

#### 234. INDIGOFERA CALONEURA, nov sp.

Frutex erectus, ramosus, fulvo-puberulus; stipulæ c. 2 lin. longæ, lineari-subulatæ, dense pubescentes; folia 1-foliolata, petiolo 3—4 lin. longo crasso dense fulvo-pubescente suffulta; foliolum ellipticum, utrinque rotundatum v. sæpius apice retusum, mucronulatum, 3—4 lin. longum, chartaceum, supra glabrum, subtus molli-pubescentibus et glaucescens, costa nervis venisque valde prominentibus et fulvo-pubescentibus; flores rosei?, parviusculi, pedicello 2 lin. longo filiformi puberulo suffulti et racemum robustum pubescentem axillarem foliis vulgo brevioribus formantes; bractæ longiusculæ, subulatæ; calyx brevis sed amplus; lineam vix altus, dentibus 3-angularibus acutis; corolla c.  $\frac{1}{2}$  poll. longa; ovarium dense sericeo-pubescentibus; legumen deest.—Pegu.—Ex affinitate *J. Brunonianæ*, Grah.

#### 235. DESMODIUM OBCORDATUM (*Uraria obe cordata*, Miq. Suppl. Fl. Sumatr. 114 et 305).

Herba perennis, volubilis, 3—4-pedalis, puberulus; stipulæ lanceolatæ, acuminatæ, pubescentes, c. 3 lin. longæ; folia pinnatim 3-foliolata, petiolo  $\frac{1}{2}$ —1 pollicari puberulo; foliola lateralia minora, deltoidea, retusa et mucronato-apiculata, foliolum terminale transverse obe cordato-lunatum,  $\frac{1}{2}$ —2 poll. latum, in sinu mucronatum, chartaceum, supra tenuissime subtus parce pilosum et pallidum, venis transversis prominentibus; flores parvi, cyaneo-

purpurei, pedicello gracili 2—3 lin. longo pubescente, in racemum gracilem pubescentem axillarem sæpius in paniculam terminalem abeuntem dispositi; bractæ lineares, subulato-acuminatæ, 2—3 lin. longæ, pubescentes, caducissimæ; calyx pubescens, lineam circiter longus, lobis lanceolatis acuminatis; corolla  $2\frac{1}{2}$  lin. longa; legumen in stipitem 1 lin. longum attenuatum, recurvatum, planum, chartaceum, puberulum, moniliformi-2—3, v. sæpius 1-articulatum; articuli hastato-rotundati, c.  $\frac{1}{3}$  poll. longi et lati; semina reniformi-oblonga, compressa, brunnea, nitentia.—Tenasserim.—Ex affinitate *D. strangulati*, &c.

236. *DESMODIUM OBLATUM*, Baker MS. (*Desmodium reniforme*, Wall. Cat. vix Dc. certissime non Burm.).

Fruticulus erectus, gracilis, 2—3-pedalis, glaber; stipulæ et stipellæ minutæ; folia 1-foliolata, petiolo capillari  $\frac{1}{3}$ — $\frac{1}{2}$  pollicari suffulta; foliolum transverse ellipticum, apice subsinuatum v. rotundatum, 1— $1\frac{1}{2}$  poll. latum, integrum, glabrum, læte virens; flores parviusculi, cyanei, pedicello capillari c.  $\frac{1}{3}$  pollicari puberulo, fasciculati et racemum gracillimum puberulum axillarem in paniculam terminalem abeuntem formantes; bractæ persistentes, ovatæ; calyx c.  $1\frac{1}{2}$  lin. longus, subglaber, lobis lineari-lanceolatis acuminatis; corolla sub-3 lin. longa; legumina in stipitem brevissimum contracta, compressa, minute puberula et glabrescentia, lineari-oblonga, moniliformia, 2—4 passim 1-articulata, articuli semiorbiculares, suturâ exteriore vix curvâ, reticulati, c. 2 lin. longi v. longiores; semina compressa reniformia pallide brunnea nitentia.—Ava, Pegu, Martaban.—Ex affinitate *D. reniformis*, &c.

237. *DESMODIUM AURICOMUM*, Grah. in Wall. Cat. 5704.

Herba annua a basi ramosa patenter fulvo-pilosa; stipulæ lanceolatæ, aristato-acuminatæ, striatæ, 2— $2\frac{1}{2}$  lin. longæ; folia pinnatim 3-foliolata, petiolo parce piloso 3—4 lineari suffulta; foliola elliptica ad obovalia, rotundata v. subretusa,  $\frac{1}{4}$ — $\frac{3}{4}$  poll. longa, supra subglabra, subtus parce appresse pilosa; flores parvi purpurei, pedicello capillari piloso  $\frac{1}{2}$ — $\frac{1}{3}$  pollicari, racemum gracilem patenti-fulvo-pilosum terminalem v. ramulos axillares terminantem formantes; bractæ vulgo sub anthesi persistentes, ovatæ, subulato-acuminatæ, 3—4 lin. longæ, fulvo-pilosæ; calyx  $1\frac{1}{2}$  lin. longus, fulvo-pilosus, lobis linearibus subulatis; corolla æquilonga v. paulo longior; legumina plana, sessilia, lineari-oblonga, ciliata et intra marginem villosa-pilosa, laxè reticulata, 3—5-articulata, articuli lin. circiter longi et lati, suturâ interiori rotundati exteriori subrecti, dehiscentes; semina reniformia, brunnea, nitentia.—Arracan, Tenasserim.—Ex affinitate *D. triflora*, &c.

238. *LESPEDeza PINETORUM*, nov. sp.

Frutex subsimplex v. ramosus robustus erectus 2—4-pedalis dense fulvescenti-pubescent; folia 3-foliolata, petiolo  $\frac{1}{3}$ — $\frac{2}{3}$  pollicari villosa suffulta; foliola elliptica ad elliptico-ovata, brevissime crasseque petiolata, 1—2



poll. longa, obtusa v. acuta cum mucrone, integra, coriacea, supra subrugosa et parce subtus dense fulvescenti- v. subcanescenti-villosa et prominenter nervosa; flores parviusculi, cyanei v. rosei, pedicello lin. longo gracili pubescente suffulti in racemos villosos-pubescentes robustos sed breviusculos axillares v. terminales dispositi et sæpius paniculam densam terminalem efformantes; calyx c.  $2\frac{1}{2}$  lin. longus, fulvescenti-villosus, lobis subulatis; corolla  $3\frac{1}{2}$  lin. longa, glabra; legumen dimidiato-ovatum, 3 lin. longum, sericeo-pubescent. — *Martaban.* — *L. hirtæ*, Miq. quodammodo affinis.

239. *LESPEDeza DECORA*, nov. sp.

Frutex erectus, 3—5-pedalis, caulibus angularibus appresse fulvo-pubescentibus dein canescentibus; stipulæ c. 3 lin. longæ, rigide, lineari-subulatæ; folia pinnatim 3-foliolata, petiolo gracili 1— $1\frac{1}{2}$  pollicari canescente suffulta; foliola breviter petiolulata, obovalia ad elliptica, apice rotundata mucronata, chartacea, 1— $1\frac{1}{2}$  poll. longa, supra atroviridia, glabra, subtus glaucescentia et sub lente appresse pubescentia; flores cærulei, pedicello gracili c.  $\frac{1}{2}$  pollicari glanduloso-pubescente instructi, racemos breves at graciles fulvo-glanduloso-pubescentes persistenter bracteatos sæpius in paniculam brevem collectos efficientes; bracteæ ovato-lanceolatæ, subulato-acuminatæ, c. lin. longæ, glanduloso-puberulæ; calyx c. 3 lin. longus, fulvo-pubescent, lobis ovatis acuminatis; corolla  $\frac{1}{2}$  poll. longa; legumina (immatura) oblique ovato-lanceolata, acuminata, compressa, breviter sericea. — *Martaban.* — *Hic Desmodium angulatum*, Wall. Cat. 5729, I. quoad specimina sterilia probabiliter e Taong-dong sumpta.

240. *LESPEDeza PARVIFLORA*, nov. sp.

Frutex, ramulis angularibus sericeo-puberulis; stipulæ rigide, lineari-subulatæ, c. 2— $2\frac{1}{2}$  lin. longæ; folia pinnatim 3-foliolata, petiolo gracili canescente  $\frac{1}{2}$  poll. longo suffulta; foliola breviter petiolulata, elliptica ad elliptico-ovata,  $\frac{1}{2}$ —1 poll. longa, chartacea, supra glabra et atroviridia, subtus glaucescentia et appresse puberula; flores cyanei?, parvi, pedicello  $\frac{1}{2}$ —1 lin. longo fulvo-pubescenti instructi et in racemos axillares strictos fulvo-pubescentes folio circiter duplo longiores apice ramorum sæpius congregatos dispositi; bracteæ deciduæ; calyx dense fulvo-pubescent, c. 2 lin. longus lobis subulatis; corolla  $3\frac{1}{2}$  lin. circiter longa; legumina (immatura) oblique ovata, acuminata, sericea. — *Martaban* (Rev. F. Mason). — *L. elliptica*, Bth. affinis, a qua differt: floribus multo minoribus, calycis lobis subulatis, bracteis deciduis et indumento.

241. *MUCUNA BRACTEATA*, Dc. (*Carpopogon bracteatus*, Roxb. MS. Jc, XX. t. 138).

Herba perennis, volubilis, novellis parce appresse pubescentibus; stipulæ...; folia pinnatim 3-foliolata, petiolo glabro v. subglabro 2—4 pollicari suffulta; foliola ovata v. subovata (lateralibus valde obliquis, terminali magis trapezoideo), petiolulo brevi pubescenti suffulta, obtusiuscule apiculata v.

cuspidata, mucronata, chartacea, supra glabra, subtus puberula v. sub lente appresse pubera; flores magni, atropurpurei, pedicello canescenti-puberulo c. 2 lin. longo suffulti, 2—3-ni v. solitarii pedunculum secundarium 2—3 lin. longum terminantes et in racemum bracteato-pedunculatum axillarem nutantem canescenti- v. fulvescenti-pubescentem dispositi; bracteae ovatae ad lanceolatae, subulato-acuminatae, velutinae, florales valde deciduae, inferiores vacuae pedunculum vestientes persistentes, majores,  $\frac{1}{2}$ — $\frac{3}{4}$  poll. longae; bracteolae paulo minores, rotundatae, deciduae; calyx amplius, c. 4—5 lin. in diametro, dense canescenti-puberulus et setis fragilibus fulvescentibus aspersus; corolla c.  $1\frac{1}{2}$  poll. longa, alae subduplo, carina vexillo subtriplo longiores; legumina oblonga v. suboblonga, compressa, 1— $2\frac{1}{2}$  poll. longa, carinis longitudinalibus secus suturam superiorem destituta densissime urenti-setosa, 2—5 sperma; semina transverse oblonga, vulgo brunneo et atromaculata.—*Pegu, Martaban, Ava.*—Species distinctissima, *M. prurienti* affinis.

242. *GRONA FILICAULIS*, nov. sp.

Volubilis, tenera; folia lato cordato-ovata, petiolo pubescente  $\frac{1}{2}$ — $\frac{3}{4}$  pollicari suffulta, obtusa, mucronata, 1— $1\frac{1}{2}$  poll. lata, utrinque sparse hirsuta, palmati nervia; flores parvi, flavi, pedicellati, cirrhoso-pedunculati, axillares; legumina tenera, glaberrima, linearia, poll. circiter longa, 5—6 sperma; semina nitentia, olivacea, nigro-maculata.—*Pegu.*—*G. Grahamii*, Bth. affinis.

243. *PUERARIA BRACHYCARPA*, nov. sp.

*A. P. ferruginea* (*Amphicarpea ferruginea*, Bth. in Pl. Jungh. I.) differt: omnibus partibus glabrior, leguminibus torosis appresse pubescentibus sub-glabrescentibus pollicem vix excedentibus 3 lin. fere latis 5—6 spermis.—*Pegu.*

*ROSACEAE.*

*Pyrus Karensium* Kurz, in Journ. A. S. Bengal, 1872, 306, eadem est ac *P. granulosa*, Bertoloni Pianta nuove Asiatiche 10, t. 3, (sub nom. *P. granulatae*) in memorie dell' Accademia d. scienze dell' istituto di Bologna, Ser. II, Vol. IV. 1864-65. Planta Khasyana cl. Bertolonii valde est serratifolia, sed formae intermediae etiam in Herbario Horti Calcuttensis adsunt. Species fere omnes Indicae a cl. Hookero et Thomsonio collectae et in opusculo hic citato descriptae et iconibus illustratae inapte propositae sunt.

*MYRTACEAE.*

244. *EUGENIA PACHYPHYLLA*, nov. sp.

Arbor glabra, ramulis albis; folia obovata ad obovato-oblonga, basi magis minusve cuneato-acuminata, petiolo crasso 3—4 lin. longo suffulta, obtusiuscula v. obtusiuscule apiculata, 3—4 poll. longa, crasse coriacea, glabra, in sicco fusciscentia, nervis lateralibus tenuibus et prominentibus

satis distantibus et subirregulari-parallelis; flores mediocres, vulgo solitarii v. terni, sessiles paniculam brevissimam crassam trichotomam terminalem efformantes, pedunculo et ramis brevissimis ( $\frac{1}{4}$ — $\frac{1}{2}$  poll.) crassiniss 4-gonis articuliformibus; calyx c. 4 lin. longus, obconicus, basi attenuatus, lævis, limbo 4-lobo, lobis rotundatis c. 2 lin. longis persistentibus; petala, etc. desunt.—Tenasserim (Dr Brandis).—Ex affinitate *E. grandis*.

245. *EUGENIA CERASIFLORA*, nov. sp.

Arbor magna, 90-100 pedalis, glabra, ramulis albidis compressiusculis; folia magis minusve lato-lanceolata, basi acuta v. acuminata, petiolo  $\frac{1}{2}$ — $\frac{3}{4}$  poll. longo, obtusiuscule acuminata v. passim obtuse apiculata, 4—7 poll. longa, pergamacea, glabra, opaca, subtus pallida, nervis lateralibus sat irregulari-parallelis et sæpius curvis tenuibus sed prominentibus; flores parviusculi, albi, pedicello gracili 2—4 lin. longo suffulti, in racemum brevem gracilem glabrum axillarem v. supra foliorum delapsorum cicatricibus orientem collecti; calyx  $3\frac{1}{2}$ —5 lin. longus, ejus pars superior amplius c. 3 lin. longa, clavato-turbinatus, lævis, limbo persistente 4-lobo, lobis semiorbicularibus 2 lin. fere longis, pars inferior pedicelliformi-contracta gracilis  $\frac{1}{2}$ —2 lin. longa; petala c.  $\frac{1}{2}$  poll. longa, conca~~v~~o-orbicularia, libera; filamenta longa, gracilia; baccae globosæ v. didymo-globosæ, pisi magnitudinis, in stipitem longum gracilem protractæ, 1—2 spermæ, læves, calycis limbo disciformi patente coronatæ.—Martaban (Etiam in montibus Sikkim Himalaya, Khasya, etc. Species juxta *E. lanceæfoliam* inserenda.

246. *EUGENIA TRISTIS*, nov. sp.

Arbor glabra, ramulis teretibus crassis pallide brunneis; folia elliptica ad elliptico-obovata, basi acuta, petiolo  $\frac{1}{2}$ — $\frac{3}{4}$  poll. longo crasso, obtuse-apiculata, coriacea, 4—5 poll. longa, glabra, opaca, nervis lateralibus subdistantibus et sat irregularibus crassiusculis et prominentibus; flores...; panicula fructicans corymbiformis, sessilis, terminalis, glabra, ramificationibus brevibus et robustis; baccae pedunculo crasso 1—2 lin. longo suffultæ, depresso-globosæ, cerasi magnitudinis, glabræ, calycis limbo discoideo patenter 4-lobo coronatæ, 2 v. 1 spermæ, endocarpio tenui carnosio; calycis lobi sub fructu c.  $1\frac{1}{2}$  lin. longi, rotundata.—Tenasserim. Ex affinitate *E. grandis*, sed foliorum indole longe distat.

247. *BARRINGTONIA AUGUSTA* (*Stravadium augustum*, Wall. Cat. 2637 pp.)

Arbor mediocris glabra; folia cuneato-oblonga ad obovato-cuneata, basi attenuata obtusa v. acuta, petiolo crasso 3—4 lin. longo, acuta v. subacuneata,  $\frac{1}{2}$ — $1\frac{1}{4}$  ped. longa, sursum crenulato-serrata, chartacea, glabra; flores conspicui, sessiles, in spicam longissimam fulvo-pulverulentam terminalem dispositi; rachis crassa basi foliis numerosis reductis lanceolatis cincta; calyx velutinus, tubo c. lin. longo v. longiore alatum 4-gono, lobis rotundatis c. 2 lin. longis; petala....; baccae (immaturæ) fibroso-carnosæ,

oblongæ, fulvo-pulverulentæ, calycis limbo coronatæ, 4-alatæ, alis carnosis et crassis angustis undulatis.—Tenasserim.

248. *BARRINGTONIA PTEROCARPA*, nov. sp.

Arbor mediocris, 30—50-pedalis, glabra; folia elongato-obovato-lanceolata, basi cuneato-acuminata in petiolum breviorē v. longiorē (usque  $\frac{1}{2}$  poll. longum) decurrentia, breviter acuminata. 1—1 $\frac{1}{4}$  ped. longa, apicem versus crenulato-serrata, pergamacea, glabra; flores conspicui, albi v. rosei (filamentis albis), sessiles, spicam longissimam robustam pulverulentam terminalem efficientes, rachis crassa basi foliis floralibus reductis numerosis lanceolatis cineta; calyx velutinus, tubo lineam circiter longo alatum 4-angulato, limbo 4-fido, lobis triangulari-ovatis acutis v. obtusiusculis plus quam 3 lin. longis; petala  $\frac{2}{3}$  poll. longa, ovato-oblonga, acuta; baccæ oblongæ, fibroso-carnosæ, c. 2 poll. longæ, 4-gonæ, angulis anguste et crasse alatis.—Pegu, Martaban.—*B. augusta* valde affinis sed differt foliis longe decurrentibus et calycis lobis.

*LYTHRARIÆ.*

249. *LAGERSTREEMIA MACROCARPA*, Wall. Cat. 2114; Voigt. Hort. Calc. 132.

Arbor parva v. mediocris 30—40-pedalis decidua, glabra; folia oblonga ad ovato-oblonga, breviter petiolata, vulgo larga præsertim juniora usque 1 $\frac{1}{2}$  ped. longa, adulta 5—6—9 poll. longa, basi obtusa v. rotundata, chartacea, obtusa, obtusiuscule apiculata v. passim acuminata, integra, glabra; flores magni, 3—4 poll. in diametro, speciosi, violacei v. violaceo-purpurei, pedicello crassiusculo canescenti-pulverulento suffulti, solitarii v. 2-ni—3-ni cymosi et in paniculam depauperatam terminalem breviusculam collecti; calycis alabastrum oblongo-turbinatum, canescenti-velutinum, tenui-sulcatum nec costatum, lobis lanceolatis acutis secus margines haud incrassatis; petala 1—1 $\frac{1}{2}$  poll. longa, lato-elliptica v. suborbicularia, unguiculata, crispato-undulata; stamina æquilonga; capsulæ lignosæ, 1—1 $\frac{1}{2}$  poll. longæ, oblongæ mucronatæ; semina *L. Flos reginæ*, sed majora.—Birmania tota.—*L. Flos reginæ* valde affinis.

250. *LAGERSTREEMIA VILLOSA*, Wall. MS. in H. B. C.

Arbor magna, 80—90-pedalis, in locis siccioribus 40—50-pedalis, ramulis, &c. dense puberulis; folia ovata ad ovato-oblonga, petiolo brevissimo pubescente suffulta, basi rotundata, chartacea, magis minusve acuminata 2—4 poll. longa, supra minute velutina, subtus subcanescenti-pubescentia v. puberula; flores parvi, albidii, pedicello gracili pubescente, in cymas pedunculatas dispositi et paniculam terminalem contractam molliter puberulam efformantes; calyx in alabastro turbinatus, dense canescenti-puberulus, 4—5—6-lobus, lobis triangularibus acutis tubum 4—6-costatum longitudine fere æquantibus, costis subaliformibus; petala minuta, calycis

dentes haud superantia, cuneato-lanceolata, acuta, alba; antheræ purpureæ; capsulæ oblongæ, semipollicem circiter longæ, mucronulatæ, valvatum 4—6-loculares.—Pegu, Martaban.

### GENTIANEÆ.

#### 251. GENTIANA NUDICAULIS, nov. sp.

Herba erecta annua glabra cauli tereti nudo 1—2 pollicari; folia apice rosulata, lineari-lanceolata ad linearia, basi snbattenuata sessilia acuta v. acuminata, usque ad  $1\frac{1}{2}$  poll. longa, coriacea, 3-nervia (nervis supra impressis); flores cyanei, raro pallide coerulei, depauperato-cymosi et folioso-pedunculati v. (in spp. Burmanicis) in glomeros densos axillares et terminales congregati; calyx  $\frac{1}{2}$  poll. longus, infundibuliformis, plicato-5-angulatus, usque ad medium 5-lobus, lobis lineari-subulatis albo-marginatis; corolla semipollicaris v. paulum longior, plicato-5-loba, lobis acutis v. acuminatis; stamina corollam longitudine subæquantes; filamenta stricta, sub medio corollæ tubi inserta; ovarium lineare, in stipitem brevem attenuatum; capsula clavata, crasse et breviter stipitata, a medio ala sursum latissima cincta stylis 2 revolutis coronata; semina minuta, exalata, oblonga. Var.  $\alpha$ . genuina, ramuli evoluti et florentes paniculam spuriam efformantes; var.  $\beta$ . compacta, ramuli suppressi indeque flores compacto-glomerati.—var.  $\alpha$ . montes Assamiæ (Griff. No. 5819); var.  $\beta$ . Martaban.

#### 252. GENTIANA CRASSA, nov. sp.

Suffrutex ramosus deorsum defoliatus; folia lanceolata ad obovato-lanceolata, basi attenuata et cum folio opposito in vaginam brevem connata, inferiora  $1\frac{1}{2}$ —2 pollicaria, coriacea, obtusiuscule acuminata, 3-nervia, secus margines subrevolutos subtrenulata: flores majusculi, sessiles et glomerati et cymam terminalem majorem v. minorem foliatam compactam formantes; calyx fere  $\frac{2}{3}$  poll. longus, tubuloso-campanulatus, teres, profunde 5-lobus, lobis valde inæqualibus, quorum 3 minimis lineari-lanceolatis e basi truncata abrupte emissis, cæteris 2 subfoliaceis tubi fere longitudinis oblongis acuminatis basi attenuatis 1-nerviis; corolla pollicaris, infundibuliformi-campanulatus, plicato-5-lobus, lobis lato-ovatis, abrupte acuminatis; stamina corolla breviora, filamentis basin versus sensim latioribus tubo basin versus insertis; ovarium lineari-lanceolatum, in stipitem crassum attenuatum; capsula compresso-lanceolata, acuminata, e corollâ marcescente semi-exserta, stipite plusquam  $\frac{1}{2}$  poll. longo suffulta, valvis stylo brevi revolutis terminatis.—Martaban.

#### PHYLLOCYCLUS, nov. g.

Calyx campanulatus, inflatus teres. Corolla subregularis, lobis imbricatis, basi sæpius bimaculatis. Stamina 4, 2 inferiora longiora fertilia exserta polline miniato scatentia, 2 superiora subinclusa filamentis brevibus suffulta effœta. Ovarium 1-loculare, ovulis numerosis placentæ bifidæ parie-

tali insertis; stylus deciduus; stigma bilobum. Capsula 1-locularis, septicide bivalvis. Semina plurima, placentis spongiosis immersa, minuta. Herbae annuæ facie Cyclophylli generis *Canscora*, sed foliis omnibus perfoliatis caulibus teretibus et floribus vulgo solitariis axillaribus. Genus *Canscora* inter alia differt: corollæ lobi 2 inferiores approximati a medio tali modo replicati ut plicis arete approximatis quasi lobum singulum mentient indeque corollam prima facie 3-lobam immitent; stamina 4, quorum unum tantum fertile et multo longius in plica loborum inferiorum receptum, cætera multo minora effæta sunt.

253. PH. HELFERIANA, (*Canscora Helferiana*, Wall. MS.).

Herba annua dichotomo-ramosa glabra 1—2-pedalis; folia perfoliata, orbicularia,  $\frac{1}{2}$ —1 poll. lata, radiato-venosa, membranacea; flores parvi, albi, pedicello brevissimo gracili suffulti, solitarii, axillares; calyx lævis, teres, campanulatus, c. 3 lin. longus, lato-4-dentatus; corollæ tubus calycis longitudine, inflatus, limbo parvo 4-lobo, lobis oblongis obtusiusculis; capsula ..... —Tenasserim (Helf. 5816).

Altera species hujus generis, *C. Parishii*, Hook. Bot. Mag. t. 5429, facile distinguitur floribus duplo majoribus, lobis multo latioribus, etc.

PEDALINEÆ.

254. BRANDISIA DISCOLOR, Hf. et Th.

Capsula ovalis, compressiuscula, semipollicem fere longa, calyce subduplo longior, fulvo-tomentosa, mucronata, semina linearia, 2 lin. longa.—*Wightiæ*, Wall., arete affinis. Etiam *Buddleiæ* generi affinis, sed differt corolla irregulari, etc. et certissime inter *Sesameas* recipienda est. *Gardneria*, a cl. Benthamo Loganiaceis adnumerata, *Solanea* esse videtur.

EUPHORBIACEÆ.

255. ACTEPHILA PUBERULA, nov. sp.

Frutex 4—8-pedalis, novellis minute puberulis; stipulæ ovatæ, breves valde deciduæ; folia elliptico-v. obovato-oblonga, basi rotundata v. subcordata, petiolo  $\frac{1}{2}$ —1 $\frac{1}{2}$  pollicari puberulo glabrescente suffulta, 4—7 poll. longa, obtusiuscule acuminata, integra, crasse membranacea v. chartacea, supra glabra, subtus secus nervos puberula et glabrescentia, in sicco flavescenti-viridia; flores aurantiaci, monoici v. dioici, solitarii, axillares; calyx coriaceus; capsula cerasi magnitudine, granulato-rugulosa, pedunculo sursum incrassato  $\frac{1}{2}$ —2 pollicari glabro suffulta.—Andamans (etiam in insulis Nicobaricis).—*Actephila* habitu et characteribus generi *Trigonostemoni* valde accedit sed ovulorum numero distinguitur. *Tylosepalum aurantiacum*, Kurz, quod cl. Muell. Arg. ad *Codiaeum* duxit, ad genus *Trigonostemon* repellendum est ubi in sect. VI. *Eutrigonostemone* inserendum (cf. Teysm. et Binnend. Cat. pl. hort. Bogor 1868, p. 223).—



256. *ANTIDESMA FRUTICULOSUM*, nov. sp.

Fruticulus 2—4-pedalis ramosus pubescens; stipulæ lineares, acuminatæ, fulvo-pubescentes, petiolo longiores, 2—3 lin. longæ; folia parva, elliptico-ad obovato-lanceolata, petiolo crasso c. lin. longo fulvo-pubescente, basi attenuatâ rotundata v. obtusa, 1—2½ poll. longa, breviter et obtusiuscule acuminata cum mucrone, passim obtusa v. retusa, membranacea, supra sparse hirsuta subtus imprimis secus nervos adpresse pubescentia; flores minuti, sessiles, in spicas breves sat robustas fulvo-tomentosas simplices v. raro compositas vulgo e ramulis reductis ortas collecti; bracteæ ovato-lanceolatæ, pilosæ, minutæ; calyx extus tomentosus, 4-partitus, lobis rotundatis subacutis; discus subglaber; stamina 2 v. 3, antheris didymis; stylus terminalis, simplex; drupæ rubræ dein atropurpureæ, suboblique ovoideæ, læves, 2—2½ lin. longæ, putamine compresso subrugoso.—Pegu.—*A. Roxburghii*, Wall. valde affinis, sed omnibus partibus minor.—*N. B. A. molle*, Mull. Arg. synonymon est *A. velutinosi*, Bl.; bracteæ dum juveniles obovatæ, dein sub anthesi lineari-lanceolatæ.

## GLOCHIDION, FORST.

Genus distinctissimum, a cl. Muell. Arg. cum *Phyllanthi* genere inapte conjunctum, structura florum femineorum et etiam (uti jam beat. Roxburghius docuit) arillo (spurio) facile distinguitur. In sicco hic arillus spurius v. potius tegumentum exterius seminis ut plurimum pulchre miniatus v. coccineus succosus more Euphorbiacearum aliarum (e. g. *Claoxylon* etc.) membraniformis indeque ab auctoribus plurimis omnino prætervisus erat. Omnes species a cl. Muell. Arg. in *Dc. Prod.* vol. XV. et a cl. Benthmio in *Flora Austr.* vol. VI. sub *Eu.*- et *Hemi-glochidione* publicatæ iterum ad genus *Glochidii* reducendæ sunt.

257. *GLOCHIDION DASYSTYLUM*, nov. sp.

Arbuscula v. frutex 15—20-pedalis, pubescens, ramulis subteretibus fulvo- v. ferrugineo-hirsutis; folia ovata, subobliqua, petiolo 1 lin. longo tomentosa, acuminata, basi rotundata v. obtusa, 2—3 poll. longa, chartacea, molliter pubescentia, adulta supra minute puberula; flores desunt, feminei fasciculati v. subumbellati; capsulæ pedicello gracillimo usque ad ½ poll. longo piloso suffultæ, depresso-globosæ, c. ¼ poll. in diametro, 3-loculares et 6-lobulatæ, patenter albo-pilosæ; columna stylaris brevis, 3-fida, lobis linearibus simplicibus patentibus pubescentibus.—Martaban.—*Gynoon hirsutum*, Wight Ic. t. 1909 habitum plantæ supra descriptæ optime representat sed certissime specificè distinctum est.

258. *GLOCHIDION LEIOSTYLUM*, nov. sp.

Frutex magnus v. arbuscula, ramulis subangulatis novellisque pubescentibus; folia oblique ovata ad oblongo-ovata, petiolo lin. longo pubescente, basi inæquali acuta v. obtusa, longius v. brevius sæpius obtusiuscule acuminata et mucronata, chartacea, supra costâ exceptâ glabra, subtus præser-

tim secus nervos puberula; flores minuti, masculi pedicello longo gracili pubescente, feminei sessiles v. subsessiles, glomerati; maris calyx vulgo 5-fidus, lobis lanceolatis acutis; stamina 3; fem. calyx 5-partitus, parce pubescens, segmentis lineari-lanceolatis acuminatis; ovarium villosum; columna stylaris conica, sursum attenuata et 3-fida, lævissima; capsulæ omnino iis *G. dasystyli* conformes, depresso-globosæ, c.  $\frac{1}{4}$  poll. in diametro, 3-loculares et 6-lobulatæ, pilosulæ, sessiles v. brevissime pedunculatæ stylis glabris.—Pegu, Martaban, Tenasserim.—Priori arcte affinis.

259. *GLOCHIDION ANDAMANICUM*, nov. sp. (*Phyllanthus Andamanicus*, Kurz in And. Rep. ed. 1. p. XVI.)

Arbuscula 25-pedalis glaberrima, ramulis compresso-angulatis; folia elliptica v. elliptico-oblonga, inferiora sæpius minora et suborbiculari-elliptica, basi acuta v. obtusa, petiolo  $1\frac{1}{2}$ — $2\frac{1}{2}$  lin. longo suffulta, obtusa v. obtusiuscule acuminata, 2—3 poll. longa, tenui-coriacea, lævia, subtus glaucescentia, flores fem. parvi, sessiles, glomerati, masculi pedicello gracili puberulo suffulti, axillares, fasciculati: calyx maris puberulus, lobis oblongis obtusis; stamina 3; calyx fem. 5-lobus, parce puberulus; ovarium villosu-tomentosum, columna stylaris crasse conica, ovarii crassitudine, truncata, stigmatibus 5—6 tuberculiformibus terminata; capsulæ 6—4-coccae, depresso-globosæ, utrinque concavæ, canescenti-puberulæ et 12—8-sulcatæ, plus quam  $\frac{1}{2}$  poll. in diametro.—Andamans.—Ex affinitate *G. Bancani*, Miq. speciei haud cum *G. Zeylanico* conjungendæ.

### CICCA, L.

Sub nomine hocce *Phyllanthi* species epicarpio carnoso a me conjunguntur; structura florum et masculorum et femineorum autem valde diversa est, viz.

Subg. I. *EUCICCA* (*Cicca*, L.) Flores tetrameri. Stamina libera 4. Glandulæ in maribus et hermaphroditis liberæ et distinctæ. Capsulæ drupaceæ, magnæ, carnosæ, sæpius 4-coccae.

Subg. II. *SECURINEGA*, Muell. Arg. Flores 5-meri. Stamina 5, libera. Discus annulari-5-gonus. Capsula bacciformis, 3- v. abortu 2-coccae, alba, in vivo magis minusve succulenta.

Subg. III. *KIRGANELIA*, A. Juss. Flores 5—6-meri. Stamina diadelphæ, interiora 3 omnino, exteriora basi tantum connata. Glandulæ in fem. distinctæ. Capsulæ bacciformes, 12—6-coccae, succulentæ, purpureæ v. atropurpureæ.

Subg. IV. *EMBLICA*, Gærtn. Flores vulgo 6-meri. Stamina in columnam connata. Ovarium 3-loculare. Glandulæ in fem. urceolato-connatæ. Capsulæ drupaceæ, magnæ, aqueo-albæ, putamine capsulari 3-cocco lignoso tarde dehiscente.



260. *CICCA* (*EMBLICA*) *ALBIZZIODES*, nov. sp.

Arbor elegans, 25—30-pedalis, novellis puberulis; folia oblonga, inferiora elliptica v. suborbicularia, subsessilia, basi rotundata, usque ad poll. longa et  $\frac{1}{2}$  poll. lata, retusa v. obtusa, chartacea, glabra, subtus glaucescentia; flores minuti, flavescentes, glabri, pedicello glabro gracili suffulti, feminei subsessiles, secus ramulos novellos pubescentes glomerati et racemum interruptum subaphyllum efformantes; calycis lobi obovato-lineares, columna staminalis longiuscula et gracilis; styli 3, basi connati, 2-fidi, lobulis latiusculis integrisque; capsulæ drupacæ iis *C. Emblicæ* conformes sed duplo majores, sessiles, in vivo plus quam poll. in diametro, globosæ, aqueo-albi et nervosæ, pericarpio carnosio acidissimo.—Pegu.

261. *CICCA* (*EMBLICA*) *MACROCARPA*, nov. sp.

Arbuscula 20—25-pedalis, habitu *C. Emblicæ*, sed cortice aspero fisso rugoso insignis, ramulis puberulis; folia anguste linearia, subsessilia, acuta v. obtusiuscula, basi rotundata, coriacea, marginibus subreflexis,  $\frac{1}{2}$ — $\frac{3}{4}$  poll. longa, glauco-viridia, glabra; flores lutescentes, pedicellis filiformibus suffulti, secus ramulos novellos breves aphyllus fasciculati et racemum compactiusculum usque poll. longum canescenti-pubescentem efformantes; calyx glaber, 6-partitus, lobis obovato-oblongis; columna staminalis gracilis, styli 3, basi breviter connati, robusti, 2-lobi, lobulis latis et brevibus 3-crenulatis; capsulæ drupacæ cum iis *C. albizzioïdis* exacte congruunt—Prome, Pegu.—*C. Emblicæ* arcte affinis, sed differt cortice, styliorum lobis et capsulis duplo majoribus.

262. *APOROSA* *VILLOSULA*, nov. sp.

Arbor sempervirens, 25—30-pedalis, novellis parce pubescentibus mox glabrescentibus; folia oblonga ad elliptico- et obovato-oblonga, basi obtusa v. acuta, petiolo apice incrassato  $\frac{1}{2}$ — $\frac{3}{4}$  glabro suffulta, breviter et obtusiuscule acuminata v. apiculata, integra v. subintegra, 3—5 poll. longa, rigide chartacea v. subcoriacea, glabra, in sicco fusciscentia et nitentia; flores minuti (masculi desunt), feminei sessiles, bracteis latis obtusiusculis glabris ciliolatis dense imbricatis protecti et spicas amentaceas breves usque semipollicem longas binas v. per plures glomeratas axillares v. supra foliorum delapsorum cicatricibus orientes efformantes; ovarium dense fulvo-villosum, stigmatibus lævibus brevibus recurvis breviter bilobis terminatum; baccæ aurantiacæ, ovoideæ, pisi majoris magnitudine, apiculatæ, parce hirsutulæ v. passim subglabræ, 2—1-loculares.—Pegu, Martaban, Tenasserim, Andamans.—*A. Roxburghianæ* nimis affinis.—N. B. *Antidesma lunatum*, Miq. = *Aporosa lunatum*, mihi; hic planta cl. Maingay No. 1416 et Wall. Cat. 5975, sub nomine "*Cynometra* fide Bentham."

263. *HYMENOCARDIA* *PLICATA*, nov. sp. (*Coccoceras plicatum*, Muell. Arg.?)

Arbor decidua, novellis ferrugineo-puberulis ; folia oblonga et elliptico-ad obovato-oblonga, petiolo poll. longo v. paulum longiore puberulo suffulta, basi 3-nervia rotundata v. subcordata et sæpius subattenuata, breviter et abrupte obtusiuscule acuminata, crenata-repanda, 3—5 poll. longa, chartacea, subtus secus nervos puberula et dense lutescenti- v. rubescenti-glandulosa ; flores dioici, masc. pedicello brevissimo puberulo, glomerati, feminei sessiles, in racemos elongatos axillares v. supra foliorum delapsorum cicatricibus egredientes dum juvenilia amentaceos collecti ; calyx masc. in alabastro globosus, subglaber ; stamina numerosa, libera ; ovarium dimerum, compressum, dense glanduloso-punctatum, transverse rugoso-plicatum, stylis 2 brevibus magnis dense papilloso-villosis terminatum ; capsulæ desiderantur.—Pegu, Martaban, Tenasserim (Helf. 4963).—Inter plantam meam et eam cl. Muell. Arg. ex descriptione discrimen nullum adest nisi ovarium dimerum, nec alato 3-gonum. *Mallotus Wallichianus*, Muell. Arg. ex Ava, a me non visa, nulla nota differe videtur. *Hymenocardia*, ovulis solitariis nec binis gaudens, a *Coccocerate* imprimis seminibus compressis et testæ textura differt. Numerus coccorum in *Coccocerate* variat 2—4 (et probabiliter usque 5).

264. *CYCLOSTEMON EGLANDULOSUM* (*Hopea glandulosa*, Roxb. Fl. Ind. II. 611).

Arbor mediocris, 40—50-pedalis, glabra ; folia subobliqua, ovato-oblonga v. ovato-lanceolata, basi acuta v. obtusa, petiolo 2—3 lin. longo gracili suffulta, integra, obtusiuscule acuminata,  $1\frac{1}{2}$ —2 poll. longa, tenui-coriacea, eleganter reticulata, glabra ; flores masculi glabri, feminei puberuli, c. 3 lin. in diametro, pedicello puberulo c.  $\frac{1}{2}$  pollicari suffulti, solitarii v. raro bini et axillares ; ovarium fulvo-velutino-pubescent, 2-loculare ; stigmata sessilia glabra, dilatato-3-angularia, crenata ; drupæ desunt.—Arracan (etiam in montibus Bengaliæ orientalis).

265. *CYCLOSTEMON SUBSESSILE*, nov. sp.

Arbuscula 25—30-pedalis, glabra ; folia oblonga ad elliptico-oblonga, basi subinæqualia, obtusiuscule et sæpius subabrupte acuminata, 4—6 poll. longa, chartacea, integra v. undulata v. obsolete crenata, glabra, laxè reticulata ; flores parvi, pedicello vix  $\frac{1}{2}$  lin. longo canescenti-pubescente suffulti, glomerati, axillares, calycis lobi concavo-orbiculares, extus canescenti-pubescentes, lineam circiter longi ; drupæ ovoideo-oblongæ, obsolete 4-lobæ, c.  $\frac{3}{8}$ — $\frac{1}{2}$  poll. longæ, pedunculo usque ad 1 lin. longo suffultæ, aurantiacæ, dense fulvo-puberulæ, 2-loculares et 2-spermæ, stigmatibus 2 v. raro 3 obtusiusculis minutis sessilibus coronatæ.—Martaban (etiam in montibus Khasyanis).

266. *HEMICYCLIA ANDAMANICA*, Kurz in And. Rep. 1870, p. 47.

Arbor 40—50-pedalis, glabra ; folia ovato-oblonga v. oblongo-lanceolata, basi rotundata inæqualia, petiolo parce pubescente glabrescente 2—3 lin. longo suffulta, caudato-acuminata, obsolete repando-serrata, rigidiuscule chartacea,

3—3½ poll. longa, eleganter reticulata, glabra; flores majusculi, pedicello minute appresse-hirsuto 1—1½ lin. longo suffulti, solitarii v. bini, axillares: calyx appresse puberulus, lobis concavo-rotundatis, 2 interioribus tenuioribus c. 2 lin. longis; stamina numerosa; drupæ pedunculo vulgo deflexo crasso 2—3 lin. longo, obverse ovoideæ, plus quam semipollicem longæ, teretes, læves, putamine semiterete, tenui-coriaceo.—Andamans. (Helfer 4962, mas).

267. *BRIEDELIA AMŒNA*, Wall. ap. Voigt. Hort. Calc. 157.

Arbuscula 15—25-pedalis, glabra; folia elliptica ad obovato-elliptica, petiolo lævi 2 lin. longo, basi obtusa, 2½—4 poll. longa, obtusa v. rotundata tenui-chartacea, glabra, subtus subglaucescentia, nervis lateralibus et reticulatione exiguis; flores glabri, masculi flavescentes, multo minores, feminei brevi-pedicellati, dense glomerati, rubri, axillares; calyx fem. glaber, lobis lanceolatis subulato-acuminatis, lin. fere longis: petala minuta, obovato—oblonga, rosea; discus orbicularis, sublobatus; drupæ globosæ, pisi magnitudine, succulentæ, atropurpureæ, læves.—Burma. Genus *Briedelia* a *Lebidieropside* differt coccis inter se non connatis et seminum testa membranacea siccæ. Drupa in *Lebidieropside* epicarpio carnosio gaudet, cocci lignosi connati et semina tegumento exteriori succoso-carnoso circumdata sunt.

268. *BRIEDELIA PUBESCENS*, nov. sp.

Arbuscula 20—30-pedalis, novellis pubescentibus; folia elliptico-ad obovato-oblonga, basi rotundata v. obtusa, petiolo c. 2 lin. longo pubescente, breviter et abrupte acuminata v. apiculata, tenui-chartacea, integra, supra glabra v. subglabra, subtus fulvescenti-pubescentia; flores parvi, albi, pedicello brevi pubescente suffulti, glomerati, axillares; calyx dense puberulus, lobis lanceolatis c. 1 lin. longis, petala obovata, truncata et 3-denticulata, discus magnus, orbicularis, aureus; drupæ desunt.—Pegu.—Habitus omnino *B. Moonii*, Thw.

269. *BRIEDELIA DASYCALYX*, nov. sp.

Frutex magnus scandens, novellis fulvo-pubescentibus; folia obovata ad obovato-oblonga, basi obtusa, petiolo crassiusculo c. 2 lin. longo suffulta, breviter acuminata apiculata v. obtusiuscula, 2—6 poll. longa, obsolete repanda, chartacea, supra glabrescentia, subtus subglaucescentia et parce pubescentia, nervis venisque valde prominentibus; flores parvi, fulvo-tomentella, sessiles, numerosi, in glomeros densos tomentosos axillares collecti et sæpius in racemum terminalem reducto-foliatum transformati; calyx extus dense fulvo-pubescent, c. 2 lin. in diametro, lobis sub fructu lin. longis lanceolatis acutis; discus orbicularis, lævis, in centro annulo setoso drupæ basin cingente auctus; petala obovato-lineararia; drupæ ovoideo-ellipticæ, pisi magnitudine, læves, atropurpureæ, succulentæ, calyce non accrescente suffultæ. Var. *a.* genuina, frutex scandens, folia multo majora et texturæ tenuioris, acuminata. Var. *β.* aridicola, frutex minor et erectus, folia minora, usque

ad 3 poll. longa et subcoriacea, obtusiuscula v. obtusa.—Var.  $\alpha$ . Ava, Prome, Pegu; var.  $\beta$ . Prome.—Ex affinitate *B. stipularis*, Bl.

270. *CLEISTANTHUS STENOPHYLLUS*, nov. sp.

Arbor v. frutex? glaber; folia lineari-lanceolata, basi acuta, petiolo 2 lin. longo, longe subulato-acuminata, 3—4 poll. longa, chartacea, integra, glabra subtus subpallida; flores minuti sessiles, pauci glomerati, axillares; bracteae ciliatae; calyx extus parce appresse pubescens; ovarium glabrum, sessile; capsulae desunt.—Tenasserim v. Andamans (Helf. 4875).—N. B. *Nanopetalum*, Hassk. ad *Oleistanthum* certissime reducendum est.

271. *CROTON ROBUSTUS*, nov. sp.

Arbustula robusta, 15—25-pedalis, novellis dense ferrugineo-lepidotis; folia elliptica v. elliptico-oblonga, petiolo crasso ferrugineo-lepidoto usque pollicem longo suffulta, basi biglandulosa obtusa v. acuta,  $1\frac{1}{2}$ —2 poll. longa, obtusa v. obtusiuscula cum v. absque mucrone, raro subretusa, coriacea, obsolete repanda v. integra, subtus parce ferrugineo v. lutescenti-lepidota et glabrescentia, nervis lateralibus tenuibus vix conspicuis; flores parvi, masculi brevi-pedicellati canescenti-villoso-lepidoti, feminei subsessiles, majores ferrugineo-lepidoti racemos breviores spiciformes formantes, rachi canescenti- v. ferrugineo-tomentoso-lepidota et sulcata; calyx tomentosolepidotus; styli 2-fidi; ovarium dense cupreo-lepidotum; capsulae globoso-ovoidae, 3-coccae, 6-sulcatae, pisi majoris magnitudine, fulvo-argenteae, obsolete lepidoto-tuberculatae; semina 3 lin. fere longa, 3-angulari-oblonga, laevia, brunnea.—Pegu, Tenasserim.—Ex affinitate *C. argyri*, Bl. (syn. *C. bicolor*, Roxb.).

272. *CROTON CALOCOCCUS*, nov. sp.

Fruticulus stellato-hirsutulus; folia elliptico-ovata v. ovata, basi biglandulosâ rotundata, petiolo gracili 3—4-lin. longo stellato-aspero suffulta, breviter acuminata, repando-serrulata, raro subintegra, 1—2 poll. longa, membranacea, flavescenti viridia, subtus stellato-pubescentia, supra stellato-aspera; bracteae minutae, subulatae, hirsutae; flores graciliter pedicellati, racemos graciles pubescentes terminales formantes; calyx hispidus, lobis sub fructu c.  $1\frac{1}{2}$  lin. longis lanceolatis; capsulae pisi magnitudine, profunde et subdivaricato 3-lobae et 3-coccae, tuberculis pilis hispidis radiantibus terminatis obtectae; semina laevia, brunnea.—Pegu, Rangoon.—Species elegans, *C. Tiglii* habitu, nulli arete affinis.

273. *CROTON FLOCCULOSUS* nov. sp.

Arbustula, novellis dense sed fugaciter albo- v. flavescenti-stellato-tomentosis; folia cordato-ovata, basi biglandulosâ 5-nerviâ cordata v. rotundata,  $1\frac{1}{2}$ —3 poll. longa et fere æquilata, obtusiuscule et subabrupte acuminata v. apiculata, crenata v. crenato-serrata (in serraturis glandulosa v. eglandulosa), membranacea, juniora subtus dense stellato floccosa, dein utrinque v. supra tantum glabrescentia; flores.....pedicellati, in racemos terminales dispositi; capsulae nutantes, pisi magni magnitudine, subglobosae et obsolete 3-angulari-

res, crustaceæ, dense et molliter canescenti-stellato-tomentosæ; semina c. 2 lin. longa, elliptico-oblonga, dorso convexo lævia.—Pegu, Prome.—*C. caudato* affinis.

274. *CROTON SUBLYRATUS*, nov. sp.

Frutex deciduus, 5—8-pedalis, novellis ferrugineo-furfuraceis; folia obovato-ad sublyrato-oblonga, basi stipitato-biglandulosâ attenuatâ rotundata v. subcordata, petiolo  $\frac{1}{4}$ — $\frac{1}{2}$  pollicari stellato-furfuraceo suffulta, obtusa v. obtusiuscule acuminata, 3—5-poll. longa, argute repando-serrulata, membranacea, adulta glabra v. subtus secus nervos stellato-aspera: flores parvi, pedicellati, stellato-tomentosa, racemum ferrugineo- v. fulvo-stellato-tomentosum ramulos novellos terminantem formantes; sepala lato-lanceolata, acuta, extus fulvo-pubescentia; petala marginibus ciliato-pubescentia; torus pilosus; stamina c. 15—20, glabra; petala in fl. fem. nulla; ovarium dense fulvo-stellato-tomentosum, stigmatibus brevibus; capsulæ parvæ, pisi minoris magnitudine, 3-cocceæ, subglobosæ, crustaceæ, læves, parce appresse-stellato-hirtæ; semina 2 lin. fere longa, albido- et brunneo-variegata, lævia.—Andamans.—*C. Tiglio* quodammodo affinis.

275. *CROTON CROZOPHOROIDES*, nov. sp.

Suffrutex erectus, 1— $1\frac{1}{2}$ -pedalis, dense stellato-tomentosus; folia ovali-oblonga v. ovalia, basi stipitato-biglandulosâ rotundata v. obtusa, petiolo  $\frac{1}{2}$ — $1\frac{1}{2}$  pollicari stellato-tomentoso subglabrescente suffulta, obtusa v. acuta,  $1\frac{1}{2}$ —2 poll. longa, indistincte dentato-crenata (denticulis pilis stellatis terminatis), crasse membranacea, juniora dense canescenti-stellato-tomentosa, supra granulato-aspera et subtus tomentella, nervis et reticulatione crassis et prominentibus; flores lutescentes, parvi, masculi pedicello 1—2 lin. longo (feminei brevi crasso) stellato-tomentoso suffulti, racemos longos stellato-pubescentes ramulos novellos axillares terminantes formantes; bracteæ conspicuæ, 2—3 lin. longæ, lineares, stellato-pubescentes et muriculis coccineoglandulosi ciliatæ, calyx extus dense fulvo-stellato-tomentosus, femineus major, lobis lanceolatis acutis; petala maris oblongo-lanceolata, marginibus albo-villosis; stamina numerosa, glabra, toro piloso inserta; ovarium dense fulvo-stellato-tomentosum, stylis coccineis, bis dichotomicè-divisis; capsulæ ovoideo-globosæ, leviter 3-lobæ, 3-cocceæ, cerasi putaminis magnitudine, apice depressæ, fulvo-stellato-tomentosæ, crustaceæ.—Species pulcherrima distinctissima, habitu omnino *Julocrotonis*.—Prome.

276. *CÆLODISCUS HIRSUTULUS*, nov. sp.

Suffrutex 1—2-pedalis, simplex, ramulis junioribus compressis hirsutis; folia opposita, suborbicularia, 5—6 poll. longa et subæquilata, basi 7-nerviâ subobsolete maculatâ cordata, petiolo  $\frac{1}{2}$ —1 ped. fere longo pubescente suffulta, brevissime et obtusiuscule acuminata, subintegra v. obsolete repando-dentata, chartacea, utrinque sparse sed longe hispida, subtus prominenter et crasse nervosa, glabrescentia et parce aureo-glandulosa; spicæ masculæ densæ

et breves, usque  $\frac{1}{2}$  pollicares, sessiles, fulvo-tomentellæ, axillares; bracteæ sublineares, calyce paulo longiores; calyx maris plusquam lin. in diametro, fulvo-tomentellus, in alabastro globosus; sepala 3, lato concavo-ovata; stamina numerosissima, glabra; flores feminei et capsulæ ignotæ.—Pegu, Prome.—*Cœlodiscus* melius species omnes Malloti includit quæ alabastro apiculato et seminibus carunculatis gaudent. Genus tali modo reformatum, characteribus stabilibus ornatum, magis naturale evadit, et inter alia *Mallotum eriocarpoidem*, *eriocarpum*, *lappaceum*, *longipedem* et *disparem* recipit.

277. *CLAOXYLON LONGIPETIOLATUM*, nov. sp.

Frutex subsimplex v. arbusculi, 8—15-pedalis, caulibus fistulosis et novellis appresse pubescentibus, folia elliptica ad ovato-oblonga, basi acuta v. obtusa, v. raro subcordata, petiolo 5—3 poll. longo suffulta, breviter et tenuiter acuminata, 4—8 poll. longa, crasse membranacea, undulato-crenata v. crenato-dentata, penninervia, utrinque scabra, subtus secus nervos parce appresse pubescentia; flores parvi, masculi racemos nutantes canescentes appresse hispidos formantes; capsula (unica tantum adest in montibus Khasya a cl. Hookero et Thomsonio collecta et a speciminibus ipsis separata) iis *Malloti eriocarpoidi* nimis affinis, profunde 3-loba, muricibus hirsutis obtecta, stylis simplicibus papilloso-fimbriatis coronata, 3-cocca, coccis pisi magnitudine.—Pegu, Martaban.—*C. longifolio* affinis.

278. *CLAOXYLON LEUCOCARPUM*, nov. sp.

Fruticulus 3—4-pedalis, caulibus fistulosis, novellis stellato-pubescentibus; folia ampla, lato-ovata, basi rotundata v. subcordata, petiolo puberulo glabrescente 3—8 pollicari suffulta, pedem circiter longo et fere æquilata, basi crasse 3- v. sub-5-nervia, breviter et obtusiuscule acuminata, repando-dentata, membranacea, supra stellato-aspera, subtus stellato-puberula, nervis venisque transversis crassis et prominentibus percursa; flores desunt, feminei breviter-pedicellati, racemos breves stellato-tomentosos axillares efformantes; calyx stellato-tomentosus, inæquali-2-sepalus; ovarium dense muricatum, stellato-hispidum; capsulæ pedunculo puberulo 2—3 lin. longo crasso suffultæ, cerasi minoris magnitudine, 3- v. raro 4- v. 2-coccae et -lobæ, stylis crassis papilloso-fimbriatis coronatæ, dense muricati (muricibus stellato-hispidis), albæ, carnosæ coriaceæ; semina subgloboso-ovoidea, lævia, pisi minoris magnitudine, arillo niveo succulento omnino inclusa.—Pegu.

279. *TRAGIA BURMANICA*, nov. sp.

Frutex volubilis, novellis appresse puberulis; folia larga, cordato-ovata, petiolo 1—3 pollicari canescenti-appresse-puberulo suffulta, basi 5-nervia sinuato-cordata, breviter et abrupte acuminata, tenui-chartacea, remote denticulata v. subintegra, 2—5 poll. longa, supra sparse albo-setulosa, flores desunt; pedunculi solitarii, graciles, 2—3 poll. longi, puberuli, e ramulis novellis axillaribus egredientes; calycis lobi sub fructu lato-ovati, foliacei, acuti, pollicem fere longi, extus sparsius, intus dense appresse setosi; capsulæ 3-

coccæ, coccis pisi majoris magnitudine, longe et rigide appresse hirsutæ, lignosæ, calyce aucto 6-foliolato sustentæ; semina globosa, velutina, pulcherrime atrobrunneo-tigrinæ.—Martaban.

BLUMEODENDRON nov. g.

Flores dioici. Calyx maris valvatus, 3-partitus. Petala nulla. Discus maris glandiformis. Stamina numerosa, libera, receptaculo centrali elevato inserta. Ovarii rudimentum nullum. Ovarium 3-loculare, ovulis solitariis. Capsula magna, fibroso-carnoso, 3-cocca. Semina magna, arillo spurio crasso involuta. Albumen saponaceum. Cotyledones foliacei, sub-orbiculares; radícula brevis.—Arbores, foliis oppositis et ut plurimum verticillatis, simplicibus, petiolis incrassato-articulatis. Flores mediocres, pedicellati, breviter racemosi, racemis fasciculatis axillaribus.

Genus a cl. Muell. Arg. cum *Malloto* incaute conjunctum.

280. BLUMEODENDRON TOKBRAI, (*Mallotus Tokbrai*, Muell. Arg. in DC. Prod. XV/2 956.) Etiam in insulis Andamanicis occurrit.

Altera species, sub nomine *Paracrotonis penduli* in Horto Bogoriensi culta et sub eodem nomine a cl. Muell. Arg. in Prodomo annotata, nomine *Bl. Muelleri* saluto. Folia sunt minora, texturæ tenuioris et subtus lævia. —*Paracroton pendulus*, Miq., mihi ignota est, sed jam racemis 3—4½-pedibus capsulisque tomentosis toto cœlo differt.

N. B. *Mallotus albus*, Muell. Arg. = *M. tetracoccus* (*Rottlera tetracocca*, Roxb. H. Ind. III. 826.)—*Rottlera alba*, Roxb. cum *Malloto paniculato*, Muell. Arg. conjungenda est.

281. CLEIDION NITIDUM, Thw. MS.

Arbuscula glaberrima; folia lato-ad elliptico-lanceolata, petiolo 2—3 lin. longo (in speciminibus Ceylonicis longiore) crasso suffulta, utrinque acuminata, a medio repando-dentata, 2—3½ poll. longa, tenui-coriacea, glabra, in sicco fuscescens; flores masculi parvi, glabri, sessiles, pauci, glomerati, spicam glabram v. indistincte puberulam elongatam oppositifoliam terminalem efficientes; calyx glaber, in alabastro globosus; flores aperti etc. ignoti.—Andamans.

282. MACARANGA MOLLIUSCULA, nov. sp.

Arbor mediocris, novellis molli-pubescentibus; stipulæ magnæ, lineari-oblongæ, acuminatæ; folia magis minusve orbiculari-ovata, petiolo 3—4 pollicari glabrescente glaucescente suffulta, basi multinerviâ lato-cordata, ½—1½ ped. in diametro, sinuato-denticulata, breviter acuminata, membranacea v. submembranacea, supra molli-puberula v. subglabra, subtus dense puberula et luteo-glandulosa, raro glabrescentia; flores parvi, masculi et feminei sessiles, illi glomerati bractea foliaceâ 2—4 lin. longâ lato-ovali v. ovatâ acuminatâ dentatâ v. pectinatâ protecti et paniculam axillarem pedunculatam subgracilem puberulam efficientes; feminei solitarii bractea cuneato-oblongâ



sæpius 3-lobâ serrato-dentatâ v. fimbriatâ foliaceâ tomentellâ c.  $\frac{1}{4}$ — $\frac{3}{4}$  pollicari subtenti, spicas simplices interruptas puberulas formantes; antheræ 5—6; ovarium appresse hispidulum, 2-loculare; styli 2, subulati; capsulæ desunt. Andamans (Helf. 4722).—

N. B. *M. gummiiflua*, Muell. Arg. = *M. denticulata*, Muell. Arg.

283. *MACARANGA MEMBRANACEA*, nov. sp.

Frutex sursum ramosus, 2—4-pedalis, novellis puberulis, ramulis glabrescentibus et glaucescenti-fuscis; folia ovata v. suboblongo-ovata, non peltata, basi 3-nerviâ subtruncata v. subsinuato-rotundata, petiolo gracili 1—3 poll. longo puberulo suffulta, 2—4 poll. longa, simplicia v. passim in lobos 2 v. 1 laterales longe acuminatos producta, remote calloso-dentata, longissime et tenuiter acuminata, juniora utrinque rubescenti-glandulosa et subvelutina, v. supra glabrescentia; flores masculi, ignoti, feminei sessiles, solitarii bini v. terni, bractea foliaceâ  $\frac{1}{2}$ — $\frac{3}{4}$  pollicari ovatâ acuminatâ lacerto-dentatâ puberulâ et glandulosâ subtenti et in capitulum involucretum pedunculo 1—3 poll. longo pubescente axillari suffultum collecti; calyx urceolatus, limbo tubulari styli basin amplectente, ovarium rubicundo-glandulosum et hirsutum, styli 2,  $\frac{1}{2}$  poll. longi, filiformes, glabri; capsulæ 2-cocceæ et 2-lobæ, coccis pisi minoris magnitudine, rubicundo-glanduloso-pulverulentæ et muricibus filiformibus glabris sparsis obtectæ; semina globosa, brunnea, lævia.—Ava, Martaban.—*M. involucreatæ* affinis.

284. *CODLEUM ANDAMANICUM*, nov. sp.

Frutex magnus, glaber; folia obovato-oblonga ad elliptica, basi acuta v. obtusa, petiolo 3—10 lin. longo, breviter et obtusiuscule acuminata, 3—6 poll. longa, pergamacea, integra, glabra; flores parvi, masculi pedicello capillari 3—4 lin. longo suffulti et racemum umbelli- v. corymbi-formem formantes, feminei paulo majores, pedicello brevissimo crasso supportati et corymbulum subsessilem ramulos novellos sæpius axillares terminantem efficientes; calycis lobi rotundati, glabri, ii fl. fem. ovati, acuti; petala in mare parva; glandulæ hypogynæ magnæ, trigono-truncatæ, carnosæ; stamina in seriebus pluribus; ovarium appresse hirsutum, stylis 3 longissimis profunde bifidis, capsulæ pedunculo nutante brevi sursum incrassato suffultæ, globoso-3-cocceæ, cerasi minoris magnitudine, indistincte scabriusculæ, lignoso-coriaceæ; semina ovoideo-elliptica, holosericeo-canescientia, variegata.—Andamans.—*C. umbellato*, Muell. Arg. affinis.

285. *CODLEUM* ? *LUTESCENS*, nov. sp.

Frutex dioicus ?, 8—12-pedalis, novellis sparse puberulis; folia lanceolata, passim subfalcata, basi acuminata, petiolo 2—3 lin. longo puberulo glabrescente suffulta, obtusiuscule acuminata, pergamacea, glabra, penninervia, in sicco flavescentia; flores masculi minuti, pedicello capillari 2—3 lin. longo suffulti, umbellati, umbellis pedunculo puberulo  $\frac{1}{2}$ — $\frac{3}{4}$  pollicari apice capitato-bracteato solitario axillari suffultis; calyx 3-partitus, leviter imbri-

catus, lobis ovato-lanceolatis, c.  $\frac{1}{2}$  lin. longis, acutis, extus appresse hispidulis; stamina c. 8—12 circa centrum læve luteum disci latiusculi continui inserta petala nulla; flores feminei etc. ignoti.—Andamans.

286. *EXCÆCARIA HOLOPHYLLA*, nov. sp.

Arbor sempervirens, glaberrima; folia alterna, oblonga ad lato-lanceolata, basi acuta v. obtusa, petiolo 3—4 lin. longo suffulta, obtusiuscule acuminata, pergamacea, integerrima, 3—6 poll. longa, nervis lateralibus curvis tenuibus; flores parvi, sessiles, masculi 3-ni v. plures, feminei basillares solitarii, bracteis brevibus latis (magnæ glandulæ utrinque insertis) protecti et racemum spiciformem oppositifolium terminalem glabrum formantes; flores masculi 2—3-andri; baccæ ignotæ.—Martaban, Tenasserim.—*E. oppositifoliæ* affinis, sed foliis integerrimis alternis statim distinguenda.

287. *EUPHORBIA SCABRIFOLIA*, nov. sp.

Herba annua, subsimplex, gracilis, 1—2-pedalis, ramis glabris in sicco sulcatis; stipulæ breves et angustæ, parce et rigide fimbriatæ; folia linearia v. elongato-lineari-oblonga, brevissime petiolata v. subsessilia, basi inæquali rotundata v. obtusa, 1—2 poll. longa, mucronato-acuta, cartilagineo-serrulata, crasse membranacea, supra glabra, subtus sparse crispato-pilosula, 1-nervis lateralibus nullis, glauco-viridia; capitula subsessilia, in cymas glomeriformes subsessiles axillares v. spurie terminales collecti, v. sæpe bina v. solitaria; involucri campanulatum, breve, extus puberulum, fauce villosum, fimbriatum, glandulis in appendicem obovato-cuneatum laceratum album plus quam lin. longum expansis; ovarium canescenti-pilosulum; styli graciles, 2-lobulati; capsulæ 3-coccae, parce crispato-pilosulæ, c. 2-lin. in diametro, coccis compresso-acutis dorso nudis; semina obsolete 3-gono-oblonga, sordide aurantiaca, opaca, lævia.—Prome, Pegu.—Ex affinitate *E. notoptera*, Boiss.

288. *EUPHORBIA EPIPHYLLOIDES*, Kurz in And. Rep. ed 2. 48.

Arbuscula 15—12-pedalis, carnosa, glabra, inermis, ramis complanatis crasse alatis, crenato-sinuatis, ad articulationes attenuatis et teretibus; stipulæ obsoletæ; folia obovalia, brevissime petiolata, basi obtusa, glabra, carnosa, nitentia, rotundata v. subretusa, nervis lateralibus obsoletis; capitula in cymulas dichotomas brevipedunculatas glabras e sinubus crenaturarum ramorum egredientes disposita; capsulæ profunde trilobæ, glabræ, iis *E. ligulariæ* consimilia.—*Andamans.*]

### URTICACEÆ.

*BALANOSTREBLUS*, nov. gen. Pl. XIX.

Flores monoici; masculi ignoti (ex inflorescentiis valde juvenilibus probabiliter amentacei?). Feminei racemosi: perianthium cum ovario connatum, sursum liberum et ovarium omnino includens, apice perforatum. Ovarium semisuperum, 1-ovulatum, ovulo pendulo; stylus perbrevis, e pe-

rianthii orificio protrudens; stigmata 2, brevia, crassa, villosula. Drupa perianthio carnosio inclusa, monosperma. Arbor lactescens, subglabra, foliis alternis grosse spinescenti-dentatis. Genus imperfecte cognitum sed distinctissimum *Antiar* affine

289. *BALANOSTREBLUS ILICIFOLIUS*, nov. sp.

Arbor ramulis scabriuscule puberulis; folia elliptica ad lato-ovalia, petiolo terete 1—2 lin. longo glabro suffulta, basi sæpius subinaequali acuta v. obtusa, rigide coriacea, spinoso-acuta, grosse spinoso-dentata, 1—3 poll. longa, glabra, supra nitida costa supra immersa subtus unacum nervis lateralibus arcuato anastomosantibus valde prominente; flores parvi, viridiusculi, pedicello brevi crasso suffulti, in racemum axillarem brevem collecti; perianthium obturbinatum, rugulose-tuberculatum, c. 2 lin. longum; drupæ pisi minoris magnitudine, rubræ, rugulosæ, carnosæ, glabræ.—*Chittagong* (Hf. et Th. sub *Sappi* sp. No. 4); *Ava* (J. Anderson).

*MUSACEÆ.*

290. *MUSA RUBRA*, Wall. ap. Voigt Cat. Hort. Calc. 579, non hort.; Kurz in Journ. Agr. Hort. Soc. Beng. XIV. 301.

Humilis, cæspitosa, caudicibus pollicem vix crassis viridibus; folia oblonga basi subrotundata glabra, petiolis brevibus foliaceo-marginatis; spathæ saltem apice imbricatæ deciduæ ovales obtusæ rubræ pruinulæ 5—6-floræ; flores aurantiaci, labio pumilo; fructus crasse truncato-rostrati lutei glabri; semina depresso-turbinata lævia.—*Pegu, Martaban.*

*LILIACEÆ.*

291. *DRACENA HELFERIANA*, Wall. MS. (*Cordyline Helferiana*, T. And. Cat. Hort. Calc. 72.)

Suffrutex parvus, decumbens, simplex v. vix ramosus, glaber, 1—2-pedalis, caudice basi radicante 3—4 lin. crasso; folia approximata, obverse lanceolato-oblonga, sessilia et basi dilatata, v. in petiolum lato-foliaceum longiorem v. breviorē vaginantem subattenuata, acuta v. breviter acuminata, 1—1½ ped. longa et 1½—2 poll. lata, subundulata, tenui-coriacea, costa apicem versus subevanescente, venis in sicco tenuibus sed prominentibus; flores albi v. in colorem purpurascētem vergentes, tubo viridiusculo, poll. longi, pedicello gracili basin versus articulato suffulti 2—3-ni fasciculati, secundi et paniculam parce divaricato-ramosam terminalem amplam glabram efficientes; bracteæ lineari-lanceolatæ, eæ ramificationum inferiorum usque ad pollicem longæ, deciduæ; bracteolæ ovato-lanceolatæ, minutæ; perianthium basi inflatum et fere usque ad basin 6-partitum, lobis linearibus obtusis tubuloso-convergentibus apice tantum patentibus; filamenta alba; baccæ 1—3 lobæ, lobis subsphæricis pisi magnitudinis aurantiacis nitidis 1-spermis.—*Pegu, Martaban, Tenasserim.*—*D. ternifoliæ* affinis.

292. *DRACÆNA PACHYPHYLLA*, nov. sp.

Fruticulus erectus v. ascendens, simplex v. vix ramosus, glaber, 1—2-pedalis, caulibus digiti minoris crassitudine v. tenuioribus; folia elliptica ad elliptico-lanceolata, acuta v. subulato-acuminata, coriacea, sæpius maculata, 4—6 poll. longa et  $1\frac{1}{2}$ — $2\frac{1}{4}$  poll. lata, costa apicem versus evanescente, venis tenuibus et prominentibus, superiora basi sensim complicato-attenuata semi-amplexicaulia, inferiora in petiolum usque ad poll. longum foliaceum basi vaginanter ampliatus abruptius contracta; flores albi, pedicello brevissimo robustiusculo articulado suffulti, racemum terminalem 1—2 pollicarem spiciformem pedunculatum glabrum efficientes; perianthium c.  $\frac{3}{4}$  poll. longum rectum, basi parum inflatum, fere usque ad basin 6-fidum, lobis erectis et tubiformi-conniventibus apice tantum erecto-patentibus; baccæ 3—1-lobæ, lobis globosis pisi magnitudine rubris nitentibus monospermis.—*Andamans.* (etiam *Malacca*, Maingay No. 1684). A *D. spicata*, specie arborea, quæ cum cl. Baker conjunxit, statura humili et perianthio recto non torto jam differt. *D. Finlaysoni*, Baker, eadem est ac *D. linearifolia*, Miq.

293. *DRACÆNA BRACHYPHYLLA*, nov. sp.

Fruticulus gracilis, parce ramosus, glaber caulibus 2—4 lin. crassis, folia linearia, sessilia basi breve petioliformi-attenuata et lato-amplexicaulia;  $\frac{1}{2}$ —1-pedalia, acuminata, tenui-chartacea, costâ apicem versus evanescente venisque tenuissimis et prominentibus; flores  $\frac{1}{2}$ — $\frac{3}{4}$  poll. longi, albi, pedicello supra medio articulado 2—3 lin. longo suffulti, bini v. solitarii, in racemos breves strictiusculos dispositi et paniculam terminalem sessilem brevem erectam glabram formantes; bractæ lineari-lanceolatæ, subulato-acuminatæ, inferiores usque ad  $\frac{1}{2}$  poll. longæ; bracteolæ ovatæ, acutæ, membranaceæ, scarioso-marginatæ, c. lin. longæ; perianthium fere ad basin 6-fidæ, lobis tubuloso-conniventibus et apice erecto-patentibus; filamenta alba; baccæ.—*Andamans.*—*D. angustifolia* affinis.

*GRAMINEÆ.*294. *ARUNDINARIA ELEGANS*, nov. sp.

Fruticosa, 6—15-pedalis, culmis digit-crassis; folia linearia, longe acuminata, brevissime petiolata, rigide chartacea, 4—5 poll. longa,  $\frac{1}{3}$ — $\frac{1}{2}$  poll. lata, subtus conspicue tessellata et, præsertim apicem versus, secus margines cartilagineas subspinuloso-scabra; foliorum vaginæ glabræ, ore truncato parce hirsuto; turionum vaginæ parce fulvo-hispidulæ, ore nudo attenuato minute auriculatæ; spiculæ pedicello gracili  $\frac{1}{2}$ —1 poll. longo suffultæ,  $1\frac{1}{2}$ — $\frac{1}{2}$  poll. longæ, 14—4-floræ, racemum terminalem paniculiformem angustum glabrum efficientes; glumæ 2, 3— $3\frac{1}{2}$  lin. longæ, superior paulo brevior; rachillæ c. 2 lin. longæ, sericeo-puberulæ, nodo barbata; valvula exterior c. 4 lin. longa, compresso-concava, lanceolata, cuspidato-acuminata, lævis; valvula interior paulum brevior compresso-navicularis, secus carinas apicem versus

2-fidum sulcatum parce pilosa; lodiculæ 2, ciliatæ; stigmata alba; antheræ purpureæ; caryopsis deest.—*Ava, Martaban.*—*A. racemosæ* nimis affinis.

295. *BAMBUSA (DENDROCALAMUS) LONGISPATHA*, nov. sp.

Cæspitosa, arborea, 40—60-pedalis, culmis brachium crassis, turionum vaginæ longissimæ, sursum culmum haud amplexantes,  $1\frac{1}{2}$ — $1\frac{3}{4}$  ped. longæ appresse brunneo setosæ, altero latere oris angustati auriculo brevi rotundato nudo membranaceo auctæ; lamina imperfecta membranacea, reflexa; lingula conspicua sed angusta, longe et grosse brunneo-setoso-fimbriata; folia lanceolata ad lineari-lanceolata, 6—8 poll. longa et  $\frac{3}{4}$ —1 poll. lata, longe acuminata, brevissime petiolata v. subsessilia, supra præsertim secus margines scabriuscula glabrescentia; subtus glaucescentia; vaginæ glabræ, ore nudo paulum productæ, ligula conspicua, fimbriata; spiculæ minutæ, truncatæ,  $2\frac{1}{2}$ —3 lin. longæ, basi attenuatæ, compactiuscule et divaricato-5-floræ, dense glomeratæ, in spicas interruptas dein in paniculam amplam transformatas collectæ; valvulæ 2 inferiores vacuæ v. gemmiparæ, superiores 3 fertiles; valvula exterior fl. herm. obovato-orbicularis, acuta, 3 lin. fere longa, nitida, valvula interior subæquilonga, anguste navicularis, secus carinas dorsi concavo-depressi parce pilosa; antheræ luteæ, mucronatæ; stylus longus, persistens, breviter 2-fidus, stigmata purpurea; ovarium et stylus hirsuti.—*Arracan, Pegu, Martaban.*—Caryopsis *Dendrocalami* non est baccata nec perigynio circumdata, sed epicarpium plane coriaceum v. subcrustaceum nec membranaceum uti in *Bambusa* sensu stricto.

296. *BAMBUSA (DENDROCALAMUS) CALOSTACHYA*, nov. sp.

Arborea, cæspitosa; vaginæ ramorum novellorum appresse fusco-setosæ, ore truncatæ, marginibus albo-ciliatis; ligula integra v. subintegra, angusta; folia larga, lato-lanceolata,  $\frac{1}{2}$ —1 ped. longa, 2—1 poll. lata, basi rotundata, breviter (vix lin. long.) petiolata, acuminatissima, marginibus et supra apicem versus scabra, subtus molliter puberula; vaginæ glabræ? conspicue albo-ciliatæ, ore non productæ; lingula conspicua, integra erosa v. fimbriata; spiculæ lato-oblongæ, compressiusculæ,  $\frac{1}{2}$  poll. longæ v. paulo longiores, 7—8-floræ, glomeratæ, spicas interruptas dein in paniculam amplam transformatas efficientes ramulis plus minus puberulis; valvulæ 2 infimæ abbreviatæ, vacuæ, sequentes omnes fertiles; valvula exterior fl. herm. lato-ovata, c. 4—5 lin. longa, acuta, lævis; valvula interior naviculari-oblonga, acuta (ea florum inferiorum etiam obtusa), basi subattenuata, exteriori brevior, dorso puberula v. raro subglabra, secus margines et carinas albo-ciliata; antheræ luteæ, longiuscule et lævi-mucronatæ; filamenta libera; ovarium cum stylo longo hirsutum; stigma simplex, purpureum? lodiculæ 1 v. 2, lanato-fimbriatæ, minutæ.—*Ava.*—*B. latifloræ (Dendrocalamus—Munro)* valde affinis.

297. *BAMBUSA (DENDROCALAMUS) CRITICA*, nov. sp.

Arborea, cæspitosa, 15—30-pedalis, culmis 1—3 poll. crassis, junioribus

appresse-albido puberulis; turionum vaginæ magnæ, appresse argente-ose-tulosæ, ore subtruncatæ; lamina imperfecta extus appresse sericeo-setulosa, basi in aurículas falcato-oblongas setoso-fimbriatas decurrens; folia lineari-lanceolata, basi truncata sæpius subobliqua, breviter (1 lin.) petiolata (superiora u. sessilia), 4—8 poll. longa,  $\frac{1}{2}$ —1 poll. lata, acuminata, subtus scabride hirtula, marginibus scabra, nervis utrinque 5—7; vaginæ glabræ? (verosimiliter juniores hirsutæ), ore haud productæ et auricula incrassata longe (pilis 2—4 lin. longis) fimbriata terminatæ; spiculæ, etc. ignota.—*Pegu.*—ex affinitate *B. strictæ*.

298. GIGANTOCHLOA (OXYTENANTHERA) MACROSTACHYA, nov. sp.

Arborea, 30—50-pedalis, cæspitosa, culmis brach. crassis; turionum vaginæ brevissimæ, 5—8 poll. longæ, dense appresse nigrescenti-setosæ; lamina imperfecta in aurículas magnas undulatas rotundato-terminatas fusco-fimbriatas decurrens; lingula angustissima, integra v. obsolete dentata; folia lanceolata, basi obtusa v. subrotundata, breviter (1 lin.) petiolata, 5—7 poll. longa,  $\frac{1}{2}$ — $\frac{3}{4}$  poll. lata v. latiora, acuminatissima, marginibus retrorse scabra, subtus albida et molliter puberula; vaginæ patenti-hirsutæ, glabrescentes, uno latere oris paulum producti minute auriculatæ et parce sed longe (2—3 lin.) fimbriatæ; lingula inconspicua; spiculæ sessiles (raro una alterave pedunculata),  $1\frac{1}{2}$ —2 poll. longæ, lineares, compressiusculæ, 6—7-floræ, strictæ v. raro curvulæ, subulato-acuminatæ, laxè glomeratæ, interrupte spicatæ et sensim paniculam amplam radicalem efficientes; valvulæ exteriores omnes rigide nigrescenti-fimbriatæ, inferiores 3 v. 4 abbreviatæ et vacuæ, superiores 3 hermaphroditæ; valvula exterior fl. herm. lineari-lanceolata, convoluta, subulato-acuminata; valvula interior anguste navicularis, præsertim sursum secus angulos dorsi deplanati atropurpureo-ciliata, apice vix bifida; antheræ purpureæ, aristato-acuminatæ; ovarium cum stylo simplici longo hirsutum; stigma album.—*Martaban, Tenasserim.*—Genus *Oxytenanthera*, Munro (excepta *O. Thuaitesii*) nulla nota differt a *Gigantochloa* nisi caryopside elongata; valvula interior in omnibus speciebus a me examinatis deplanata et bicarinata evadit. *Gigantochloæ* genus valde artificiale et filamentis connatis vix ac ne vix a *Bambusâ* differt. Habitus et spicularum structura in generibus *Bambusa* et *Gigantochloa* simili modo variat et species ex habitu arctissime affines, e. g. *B. polymorpha* et *Gigantochloa aspera* spiculis omnino inter se differunt.

299. MELOCANNA HUMILIS, nov. sp.

Fruticosa, cæspitosa, 8—15-20 pedalis, culmis  $\frac{1}{4}$ —1 poll. crassis; turionum vaginæ glabræ? brevissimæ, ore sinuato valde producto rotundatæ et ampliata; lamina imperfecta linearis, erecta, basi in marginem polito-viridem angustum decurrens; lingula angustissima, integra; folia lanceolata ad lineari-lanceolata, basi obtusa, petiolo 2—3 lin. longo suffulta, subulato-acuminata, 4—6 poll. longa  $\frac{2}{3}$ —1 poll. lata, secus marginem alterum scaberrima

subtus glaucescentia et scabrido-puberula; vaginæ glabræ, ore minute auriculato longe fimbriatæ; spiculæ, etc. ignota.—*Pegu, Arracan. Melocanna* a *Schizostachyo* differt caryopsidis epicarpio crasse carnosio et perigynii absentia.

300. *CEPHALOSTACHYUM FLAVESCENS*, nov. sp.

Fruticosa, caespitosa, 10—15-pedalis, culmis poll. circiter crassis; turionum vaginæ fragiles, appresse albo-setulosæ, lamina imperfecta erecta v. suberecta, inflato-cordata, convoluto-acuminata, basi in appendices latas undulatas fimbriatas falcatas decurrens, quarum una deflexa altera sursum vergens; lingula c. 2 lin. lata, erosodentata; folia parva, linearia, 3—5 poll. longa,  $\frac{1}{3}$ — $\frac{1}{2}$  poll. lata, acuminata, basi rotundata, brevissime petiolata marginibus præsertim apicem versus scabra, cæterum glabra; vaginæ glabræ, ore vix producto minute et incrassato-auriculatæ et pauci-fimbriatæ; spiculæ cylindrico-lineares, acuminatæ, c.  $\frac{1}{2}$  poll. longæ, albo-pilosæ, 3-floræ, dense glomeratæ et interrupte spicatæ, dein sensim in paniculam radicalem amplam collectæ; valvula infima vacua, sequentes hermaphroditæ cum terminali hebetata; valvula interior et exterior fl. herm. subconformis, albo-pilosa, subulato-acuminata, illa dorso subdeplanato apicem pilosum versus bicarinata; lodiculæ 3, lanceolatæ, acuminatæ, ciliolatæ; antheræ primum viridiusculæ et purpurascenti-punctatæ, dein pallide flavæ, acutæ v. obtusæ; perigynium elongato-lageniforme, cum rostro triquetro parce pilosum; stigmata 3, brevina, albo-pilosa; pericarpium.....—*Pegu*, in H. B. C. culta.—*C. pergracili* affine.—Genus *Teinostachyum* a *Cephalostachyo* more *Arthrostylidii* rachillis elongatis tantum differt et, in opinione mea, rejiciendum est. *Schizostachyum Blumei* Munro, non N. E. species est nova Hindostanica, *Sch. Hindostanicum* nominanda.

301. *PSEUDOSTACHYUM COMPACTIFLORUM*, nov. sp.

Arborea, caespitosa, semiscandens, culmis 1—1 $\frac{1}{2}$  poll. crassis; turionum vaginæ lævissimæ, lamina imperfecta in auriculam angustam reflexam lunato-productam patenter fimbriatam decurrens, lingula integra, angustissima; folia larga, oblongo-lanceolata ad lanceolata, basi oblique truncata v. obtusa, breviter (1—2 lin.) petiolata, 6—10 poll. longa, 1—2 poll. lata, subulato-acuminata, glabra, uno latere apicem versus scabra; vaginæ appresse sericeo-setosæ, mox glabrescentes, ore truncato in auriculam lunatam reflexam longe (3 lin.) fimbriatam productæ, ligula integra, angusta; spiculæ minimæ, 2—2 $\frac{1}{2}$  lin. tantum longæ, iis *Bambusæ longispathæ* consimiles, latæ et sub anthesi quasi truncato-2-fidæ, 5-floræ, dense glomeratæ et interrupte spicatæ, dein sensim in paniculam amplam radicalem collectæ; valvulæ inferiores 2 vacuæ, sequentes 2 hermaphroditæ, cum flosculo terminali longe pedicellato obovato; valvula exterior fl. herm. lato-ovalis, ventricosa, brevissime mucronata, nitens, c. 2 lin. longa; valvula interior æquilonga, lato-navicularis, apice 2-denticulata, secus angulos dorsi depressi albo-ciliata;



lodiculæ 3, maximæ, ovales, obtusæ, longe fimbriatæ; antheræ virescenti-luteæ, perigynium cum rostro brevi truncato glabrum; stigmata brevia, albo-plumosa; pericarpium maturum pomi feri magnitudinis, irregulari-globosum, nitens, rigide coriaceum; semen maximum, carnosum, mox germinans.—*Martaban.*

302. *PSEUDOSTACHYUM HELFERI*, nov. sp. (*Bambusa Helferi*, Munro, ?)

Subscandens, cæspitosa, arborescens, culmis poll. circiter crassis; turionum vaginæ fugacissime albido-setulosæ, lamina imperfecta patens, basi attenuata in auriculum parvam longe fimbriatam producta, lingula angustissima setis albis 2—1 lin. longis fimbriata; folia larga, oblongo-lanceolata, basi vulgo inæqualia, breviter (1—2 lin.) petiolata, acuminata,  $\frac{1}{2}$ —1 ped. longa 2—2 $\frac{1}{2}$ —3 poll. lata, juniora secus margines scabra, mox glabra, subtus glaucescentia; vaginæ apparenter glabræ, ore parum producto et uno latere minute fimbriato-auriculatæ; lingula fimbriata, fragilitate pilorum mox integra v. indistincte denticulata; spiculæ, etc. ignota.—*Pegu, Martaban.*

303. *DINOCHELOA ANDAMANICA*, nov. sp.

Alte scandens, culmis poll. circiter crassis; turionum vaginæ sparse albido-setulosæ, ore nudo rotundata et vulgo undulata; lamina imperfecta erecto-patens, supra hispidula, lingula minute denticulata, sinum oris marginans; folia larga, oblongo-lanceolata ad lanceolata, basi rotundata, brevissime petiolata, setaceo-acuminata, 6—12 poll. longa, 1—2 poll. lata, utrinque lævia; vaginæ glabræ, ore parum producto subrotundatæ, lingula angusta, albida, os totum marginans et integra; spiculæ minutæ,  $\frac{1}{2}$ —1 lin. longæ, ovatæ, nitidæ, stramineæ, glabræ, sessiles, glomeratæ, interrupte spicatæ et in paniculam racemiformem angustam terminalem collectæ; valvula inferior saccato-cymbiformis, abbreviata, retuso-mucronata, vacua; valvula exterior fl. herm. lato-convoluta-ovata, acuta, lævis, lin. fere longa; valvula interior conformis; antheræ spurie 4-loculares, acuminatæ; ovarium etc., ignota....*Andamans (etiam in insulis Nicobaricis).*—*D. Tjangkorreh* affinis, sed spiculis multo minoribus pallidis (nec brunneis) foliis multo majoribus et ligula vaginarum differt. Specimina ex insulis Phillipinis, valvula interiore ciliata gaudentia et a cl. Munro cum *D. Tjangkorreh* conjuncta mihi est species nova et etsi eam non vidi *D. ciliatam* nomino.

304. *DINOCHELOA MACLELLANDII*, (*Bambusa Maclellandii*, Munro in Linn. Trans. XXVI. 114).

Alte scandens, culmis pollicem crassis; turionum vaginæ fugaciter appresse argenteo-setulosæ ore incrassato polito-marginatæ; ligula brevis, integra; folia magna, oblongo- ad ovato-lanceolata, basi rotundata, breviter (1—2 lin.) petiolata, subulato-acuminata,  $\frac{1}{2}$ —1 $\frac{1}{2}$  ped. longa, 1 $\frac{1}{2}$ —3 $\frac{1}{2}$  poll. lata, lævia, uno latere apicem versus retrorse scabra; vaginæ juniores appresse argenteo-setulosæ, mox glabrescentes, ore parum productæ et auricu-

la appressa rotundata nitente nuda terminatæ, lingula os totum occupans, integra; spiculæ, etc. ignota.—*Pegu, Martaban.*

### CORRIGENDA ET ADDENDA.

*Pueraria brachycarpa*, supra p. 232, dele observationem "Spatholobus crassifolius Bth. Diocleæ est species," et adde:

#### 243b. *PUERARIA STRICTA*, nov. sp.

Herba perennis erecta 2—4-pedalis, ramis subteretibus novellis canescenti-tomentosis; folia pinnatim 3-foliolata, petiolo  $1\frac{1}{2}$ —2 pollicari pubescente suffulta; foliola ovata, lateralia inæqualia, 2—3 poll. longa, acuta v. breviter acuminata chartacea utrinque sparse appresse hirsutula; flores desunt; racemi canescenti-tomentosi simplices axillares et in paniculas terminales collecti; bracteæ parvæ, subulatæ, persistentes; pedicelli sub fructu c. 2 lin. longi, calyx c. lin. longus puberulus; legumina lineari-oblonga,  $1-1\frac{1}{2}$  poll. longa,  $2\frac{1}{2}$  lin. lata, plana, glabra, pallida, 7—9-sperma; semina compresso-orbicularia, nigra, c. 2 lin. lata.—*Pegu, Martaban.*

#### 243c. *PUERARIA HIRSUTA*, nov. sp.

Herba perennis volubilis v. prostrata ramis obtuse angulatis et retrorse appresse hirsutis; folia pinnatim 3-foliolata, petiolo patenter hirsuto 2— $2\frac{1}{2}$  pollicari suffulta; foliola ovata ad ovato-lanceolata, lateralia obliqua, acuminata, chartacea,  $2\frac{1}{2}$ — $3\frac{1}{2}$  poll. longa, utrinque (præsertim subtus) sparse appresse hirsuta; flores desunt; racemi vulgo bini v. terni dense fulvo-hirsutuli, axillares; bracteæ deciduæ; pedicelli sub fructu c. lin. longi; calyx parvus; legumina oblongo-v. lineari-lanceolata,  $\frac{1}{2}$ —1 poll. longa, 3— $3\frac{1}{2}$  lin. lata, plana et subtorosa, sparse sed longe et patenter hirsuta, 2—4-sperma; semina transverse ovoidea, compressa, pallida v. pallide brunnea, nitida, c.  $2\frac{1}{2}$  lin. lata.—*Pegu.*

### *Explanatio tabularum.*

- T. XVIII. *Gonocitrus angulatus*, Kz. Fig. 1. ramus fructiferus; f. 2. fructus; f. 3. id. longitudinaliter sectus; f. 4. id. horizontaliter sectus; f. 5. semen, magnitudine paullo auctum; f. 6. semen longitudinaliter sectum.
- T. XIX. *Balanostreblus ilicifolius*, Kz. Fig. 1. ramus florens plantæ femineæ; f. 2. ramus fructicans; f. 3. racemus florum femineorum; f. 4. flos femineus perianthio remoto ovarium exhibens; f. 5. flos femineus longitudinaliter dissectus; f. 6. fructus maturi sectio verticalis. Fig. 3—6 omnes magnitudine auctæ.

NOTES ON THE CERTHIINÆ OF INDIA,—by W. E. BROOKS, Esq., C. E.,  
Dinapore.

(Received September 8th, read November 5th, 1873.)

With a good series of about thirty to work with, it appears to me that we have decidedly five species in India.

I.—*CERTHIA HIMALAYANA*, Vigors.

A well-known species which need not be described here, and which is distinguished from the others by its well-barred tail, the other species having the tail only occasionally obscurely rayed.

II.—*CERTHIA HODGSONI*, Brooks.

The differences between this bird and the European *C. familiaris* have been already pointed out.\*

I regard the *four* outer plain or unspotted primaries of *C. Hodgsoni* versus the *three* plain ones of the English bird, as conclusive evidence of the distinctness of the two species. The much longer and straighter bill, with the white lower mandible; and the greyer and less rufous tone of plumage, with much whiter spotting on the back and head, should also be taken into account. The legs and feet of the English bird are also, as a rule, darker. The voices of the two birds differ; that of the English one being much louder and somewhat different in tone. The Indian species is much more silent. I have before noted the conspicuous difference in the eggs.

This species is the *C. familiaris* of some Indian ornithologists.

III.—*CERTHIA NIPALENSIS*, Hodgson.

*Certhia discolor*, Blyth.

Any one who has examined Mr. Hodgson's drawing of *C. Nipalensis*, must have seen at a glance that it represents the earthy brown breasted bird; and I have therefore no hesitation in uniting both species under Hodgson's term.

The supposition that the brown-breasted bird could be identical with either of the two species next to be described, is a great mistake, as a good series at once shews. As far as my own observation goes, the sexes of the *Certhiinae* are alike in plumage. Even the young and old are very similar. The earth-brown tint of *C. Nipalensis* commences from the base of the lower mandible; and the chin and throat, which are generally protected from getting soiled in most birds, are in this species as dark as any part of the breast. The idea that the brown lower surface is merely produced by the feathers being soiled, is against the rule with regard to Creepers, which preserve the purity of their plumage in a remarkable manner, even near large manufacturing towns. The colour on the breast of *C. Nipalensis* is, as Mr. Blyth observed, a fast colour.

\* Journ. A. S. Soc. Beng. Vol. XLI, Part II, p. 73.

The tail of this species is more rufous than that of any of the others. In other respects the colouration of the *upper* parts is similar to that of the two species next to be described. *C. Nipalensis* has a large and rather strong bill compared with those of the others.

Hab. Nepal and Sikkim.

IV.—*CERTHIA STOLICZKA*, n. sp.

This species, as far as the upper surface is concerned, resembles *C. Nipalensis*, but the bill is much shorter and weaker. The chin and throat are fulvous, and breast warm buff, increasing in rufous tone to the flanks and lower tail coverts, which are bright rusty brown. The rump and upper tail coverts, as in *C. Nipalensis*, are bright rusty brown, even brighter perhaps than in that species; but the colour of the tail feathers is less rufous, particularly so as regards the shafts of the feathers. The long claws, especially those of the anterior toes, and the large foot, are noticeable in this new species; in fact, it could almost be separated by the foot alone. Sometimes its throat alone is nearly white, but from this point the fulvous tone covers the lower surface.

I have much pleasure in naming it after my friend Dr. Stoliczka, to whom Indian naturalists are so much indebted.

Hab. Sikkim.

V.—*CERTHIA MANDELLII*, n. sp.\*

A bird of similar dimensions to the last, but with a longer and more curved bill, and smaller feet and claws.

The throat and breast are bright silky white; abdomen and sides tinged with brown, and flanks slightly washed with rusty: lower tail coverts pale rusty brown; upper tail coverts, as in the last, bright rusty brown; tail plain brown with the shafts rather rufous. In the colour of the tail being less rufous, this bird differs much from the last. Its principal characteristics are, however, the pure white breast, instead of the buff one of the last species, while the upper surface of the bird is very similar.

One of the eight specimens differs notably from all the others, by having a warm rosy tinge suffusing the white of the breast and throat. I do not, however, think this sufficient ground upon which to make a new species, and will not, therefore, name it provisionally; but will leave this to any one who will take the trouble to investigate the creepers further than I have done. The present species is named after Mr. Mandelli who sent me the two new species I have just described, and who placed all the creepers in his collection at my service.

Hab. Sikkim.

In examining examples of this genus, care is necessary to keep the long loose feathers in their proper places. The rufous feathers of the rump often

\* This species is probably the "*Certhia Nipalensis*" of Jerdon's Birds of India; as the "lower parts" of the last are not "pure white."

get twisted out of place, so as to shew more or less on the under surface of the bird. So also with regard to the correct colour of the flanks. I conclude with a table of dimensions.

|                        | Wing. | Tail. | Bill. |                                   |
|------------------------|-------|-------|-------|-----------------------------------|
| <i>C. Nipalensis</i> , | 2.7   | 3.1   | .55   |                                   |
| "                      | 2.64  | 3.15  | .57   |                                   |
| "                      | 2.7   | 3.15  | .54   |                                   |
| "                      | 2.76  | 3.2   | .55   |                                   |
| "                      | 2.65  | 3.12  | .5    |                                   |
| <i>C. Stoliczka</i> ,  | 2.75  | 3.25  | .47   |                                   |
| "                      | 2.9   | 3.3   | .45   |                                   |
| "                      | 2.78  | 3.16  | .45   |                                   |
| "                      | 2.67  | 3.12  | .42   |                                   |
| "                      | 2.86  | 3.22  | .43   |                                   |
| "                      | 2.78  | 2.84  | .45   |                                   |
| "                      | 2.57  | 2.52  | .43   |                                   |
| <i>C. Hodgsoni</i> ,   | 2.54  | 2.5   | .68   |                                   |
| "                      | 2.5   | 2.3   | .67   |                                   |
| <i>C. familiaris</i> , | 2.33  | 2.2   | .43   |                                   |
| "                      | 2.45  | 2.15  | .53   |                                   |
| "                      | 2.4   | 2.15  | .42   |                                   |
| <i>C. Mandellii</i> ,  | 2.5   | 2.7   | .44   |                                   |
| "                      | 2.73  | 2.83  | .56   |                                   |
| "                      | 2.7   | 2.3   | .52   |                                   |
| "                      | 2.7   | 2.67  | .53   |                                   |
| "                      | 2.6   | 2.6   | .56   | The rosy-breasted example.        |
| "                      | 2.5   | 2.47  | .45   |                                   |
| "                      | 2.65  | 2.35  | .55   |                                   |
| "                      | 2.32  | 1.82  | .25   | A young bird but fully feathered. |

Mr. Mandelli says "to my recollection the dirty and brown-throated and breasted creepers (*C. Nipalensis*) are always found at low elevations. The white-breasted ones (*C. Mandellii*), always at high elevations. I know nothing about the yellow-breasted ones." (*C. Stoliczka*).

The latter were procured by Mr. Mandelli's shikaree but at what elevation I have not ascertained.

ON A NEW GENUS AND SPECIES (*Hylæocarcinus Humei*) OF LANDCRABS  
FROM THE NICOBAR ISLANDS,—by JAS. WOOD-MASON, of *Queen's*  
*College, Oxford.*

(With Plates XV & XVI.)

(Received and read August 6th, 1873.)

Milne-Edwards, in his classical work on the entire class of crustacea published in 1837, divides\* the four then recognized genera of the small but remarkable group of *Gecarcinida*, or Landcrabs properly so-called, into two divisions accordingly as they have the terminal joints of the external maxillipeds completely exposed, or inserted on the internal face of the third joint near its summit and completely hidden beneath it; and Dana† in his great work not only adopts these divisions but gives them subfamilial names:—"The *Gecarcinida*," he says, "pertain naturally to two groups or subfamilies, one having the termination of the outer maxillipeds *exposed* as usual, the other having this part concealed beneath the second and third segments. The subfamilies and genera are as follows:—

SUBFAM. 1. UCAINÆ. Articulæ maxillipedis externi 4tus apertus.

1. *Maxillipedes externi non hiantes.*

G. 1. UCA, *Leach.* Articulæ maxillipedis externi 4tus angulo externo insitus.

G. 2. GECARCINUCUS, *Edwards.* Articulæ maxillipedis externi 4tus marginis medio apicalis 3tii insitus.

2. *Maxillipedes externi late hiantes.*

G. 3. CARDISOMA, *Latr.* Articulæ maxillipedis externi 4tus apice 3tii externo insitus.

G. 4. GECARCOIDEA, *Edwards.* Articulæ maxillipedis externi 4tus marginis medio excavato apicalis 3tii insitus.

SUBFAM. 2. GECARCININÆ. Articulæ maxillipedis externi 4tus et sequentes 3tio celati.

G. 1. GECARCINUS, *Latr.*

This division is unnatural as separating the genus *Gecarcoidea* (hodie *Pelocarcinus*) from *Gecarcinus* to which it is most closely related, and ranging it with others with which its relations are more general; and the classificatory value of the character upon which it is based is, moreover, much diminished, if not altogether destroyed, by the discovery of a new form presenting an interesting transition from the former to the latter genus in this very character. A more natural result can, however, be attained, and

\* Hist. nat. des Crust., Vol. II, p. 20.

† Unit. States Expl. Exped., Crust., Vol. I, pp. 374-375.



Dana's family names still retained, by the substitution of another maxillipedary character for the one originally selected and now proposed to be rejected: *Gecarcinus*, *Pelocarcinus*, and *Hylæocarcinus*, in fact, agree with one another and differ from all other genera of the family in that the exopodites of their outer foot-jaws are short, without flagella, and completely concealed from view beneath the second joints. The several genera of *Gecarcinidæ* divided into two groups or subfamilies accordingly as they have the exopodites of their outer foot-jaws provided with a flagellum and applied to the external margin of the second and third joints so as to be externally visible; or have them short and rudimentary without flagella, and concealed beneath the second joint; will then be distributed as follows:

SUBFAM. I. UCAINÆ.

Genus 1. UCA, *Leach*.

„ 2. GECARCINUCUS, *M.-Edw.*

„ 3. CARDISOMA, *Latr.*

SUBFAM. II. GECARCININÆ.

Genus 1. GECARCINUS, *Latr.*

„ 2. PELOCARCINUS, *M.-Edw.*

„ 3. HYLÆOCARCINUS, *Wood-Mas.*

A careful study of all the numerous figures and descriptions of species of GECARCINIDÆ, and, in the cases of the genera *Cardisoma* and *Gecarcinucus*, of actual specimens has convinced me that the GECARCININÆ further agree with one another in the structure of the *epistoma* which in them is of great length from before backwards and nearly horizontal, thus differing remarkably from the UCAINÆ in which it is short and nearly vertical; this part has in *Pelocarcinus* been described by Milne-Edwards\* as “grand, complètement à découvert et confondu en arrière avec le palais,” and it appeared to me to pass insensibly into the *endostoma* or ‘palate’ in *Hylæocarcinus* also until I had removed the thick clothing of coarse hairs that obscured the parts when I found no difficulty in distinguishing them. It is also a notable fact that the three most closely-allied species of the former, viz., *Gecarcinus ruricola*, *Pelocarcinus Lalandei*, and *Hylæocarcinus Humei*, have six rows of strong spines to the terminal joints of the walking legs, and I would also draw attention to the shallow yellow scars situated in all three on each side of the eye and on other parts of the carapace—tell-tale marks of their descent from a common ancestor!

HYLÆOCARCINUS, † n. gen., Wood-Mason.

Proc. As. Soc. Bengal, August 1873, p. 161.

\* Arch. du Mus., 1855, Vol. vii, Pl. xv, fig. 2a.

† ἰλαῖος, sylvester, et καρκίνος, cancer.



Front not united to the internal suborbital lobes as it is in the genera *Gecarcinus* and *Pelocarcinus*, but separated from them by spaces at least as wide as the deep bold fissures that divide to their bases the internal from the external suborbital lobes; into these interspaces project the flagella of the antennæ, the basal joints of which appendages lie tightly wedged between the internal margins of the internal suborbital lobes and the epistoma. The third joint of the external maxillipeds with an obtuse-angled emargination in its anterior border; the external margins only of the first of the three terminal joints is barely visible externally when the appendages are properly closed, its external surface being flattened for movement upon the inner face of the preceding joint: in *Gecarcinus* these terminal joints are completely hidden from view, the angular process that projects like a pillar in demi-relief from the inner face of the third joint and supports them, ending abruptly so very far short of the anterior margin of the joint: in *Hylæocarcinus* the similar but stouter pillar-like projection that carries these joints at its summit extending much farther towards the extremity of the joint than it does in *Gecarcinus* but certainly failing to reach it, these joints can consequently be only partially visible: in *Pelocarcinus* they are completely visible, being articulated to the apex of the third joint.

*HYLÆOCARCINUS HUMELI*, n. sp.

The carapace is at once distinguished from that of *Pelocarcinus Lalandei*, M.-Edw. by its more arched outline in front, and by the two rounded tubercles on the mesogastric lobe which, as in *Gecarcinus ruricola*, is limited off antero-laterally from the rest of the gastric region by very shallow depressions passing off from the hinder end of the profoundly-deep median groove and joining the branchio-gastric groove on each side; the straight line representing its greatest breadth crosses it just in front of these tubercles; in front of this imaginary line its upper surface is very convex and much swollen everywhere, but behind it flat; it is just perceptibly angulated on each side for a short distance beyond the external margin of the orbits, these angulations corresponding to the lines of spiniform tubercles seen in the same position in *Gecarcinus ruricola*. The outer slopes of the branchial regions, both anteriorly and posteriorly, and the floors of the branchial chambers, all the inflected portions of the carapace in fact, covered with squamiform tuberculated lines which, fine and delicate above, become shorter and coarser as they approach the bases of the legs and the buccal frame. The anterior is divided by a shallow transverse impression slightly interrupted in the middle line from the posterior cardiac lobe, which, just as in the rest of the *Gecarcinidæ*, is much expanded posteriorly between the bases of the posterior pair of legs.

The interantennular septum is formed mainly by the subfrontal lobe,

but partly by a short triangular process of the epistoma. The flagella of the antennæ are rudimentary. Both divisions of the suborbital lobes have their margins roughened with small tubercles, but the external one not nearly so distinctly so as it is represented to be in fig. 1 of pl. XVI.

The sternal region is much broader than long, its greatest breadth being between the bases of the second pair of legs.

The male appendages are very stout and long, reaching beyond the fifth postabdominal somite, and are connected at their bases with a remarkably stout and highly indurated semicircular plate which arches over the intestinal canal; a similar plate has been observed in the genus *Cardisoma* by S. I. Smith,\* and is, doubtless, present in all *Gecarcinidæ*.

Postabdomen of the female broadly oval, about as broad as long, covering all but the margins of the sternal region, broadest across the posterior third of its fifth somite; last segment, trefoil-shaped, its sides being slightly emarginate, with its antero-lateral angles slightly covered by the produced postero-lateral angles of the preceding somite.

The chelipedes are equal and very powerful in the male; subequal and slenderer in the female; their meropodites, which in the male, as in *Pelocarcinus Lalandei*, extend much beyond the lateral borders of the carapace, but which in the female hardly reach the level of the branchial regions, have a few obtuse tubercles on their anterior, and some coarse tuberculated squamiform ridges on their posterior angles. The chelæ are granulated and ornamented, especially on the fingers, with minutedark-coloured smooth tubercles: their toothed prehensile edges meet, in the male, only at the extremities which are feebly excavated spoonlike; the margin of the spoonlike excavation in the propodite is notched for the reception of the external cutting edge of the dactylopodite, so as to form scissor-like organs.

The ambulatory legs are also remarkably powerful; their meropodites have their edges and sides much roughened by squamiform tuberculation; the upper crest of their carpopodites is armed with a row of minute spinules; their propodites have a row of stronger spines on each of their four angles, and the dactylopodites are provided with six rows of spinelike teeth.

*Colours*: upper surface of the carapace and the legs red violet, the claws whitey-brown faintly tinged with reddish violet; the scars at the extra-orbital angles, in the middle of the branchio-gastric suture on each side of the mesogastric region, etc., and the margins of the orbits, yellow; the flat posterior portion of the carapace is also much variegated with impure yellow.

|                                       |          |
|---------------------------------------|----------|
| Breadth of carapace of the male,..... | 108 m m. |
| Length " " " ".....                   | 80 m m.  |
| ∴ B : L :: 1.35 : 1;                  |          |

\* Trans. Connecticut Academy, 1870, Vol. II, p. 142.

|                                          |          |
|------------------------------------------|----------|
| Breadth of carapace of the female, ..... | 96 m m.  |
| Length " " " " .....                     | 73 m m.  |
| ∴ B : L :: 1.315, etc. : 1.              |          |
| Length of left claw of male, .....       | 88 m m.  |
| Ditto right ditto, .....                 | 87 m m.  |
| Height left ditto, .....                 | 38 m m.  |
| Ditto right ditto, .....                 | 38 m m.  |
| Length of left claw of female, .....     | 55 m m.  |
| Ditto right ditto, .....                 | 57 m m.  |
| Height of left ditto, .....              | 21½ m m. |
| Ditto right ditto, .....                 | 25 m m.  |
| Length of post-abdomen of female, .....  | 55 m m.  |
| Breadth ditto ditto, .....               | 51 m m.  |


*Hab.* The dark dense damp forests of the Nicobar Islands. I captured a male and a female on Treis Island. Another specimen with a much distorted carapace was subsequently taken on Narkondam Island by Mr. Allan O. Hume, C. B., after whom I have named it.

#### *Explanation of the plates.*

Pl. XV. *Hylacarcinus Humei*, Wood-Mason, male, nat. size.

Pl. XVI. Fig. 1. Facial region of the same. Fig. 2. Front view. Fig. 3. Post-abdomen of the male. Fig. 4. External maxilliped of the left side viewed from the outside. Fig. 5. Internal view of the same. All the figures of the natural size.

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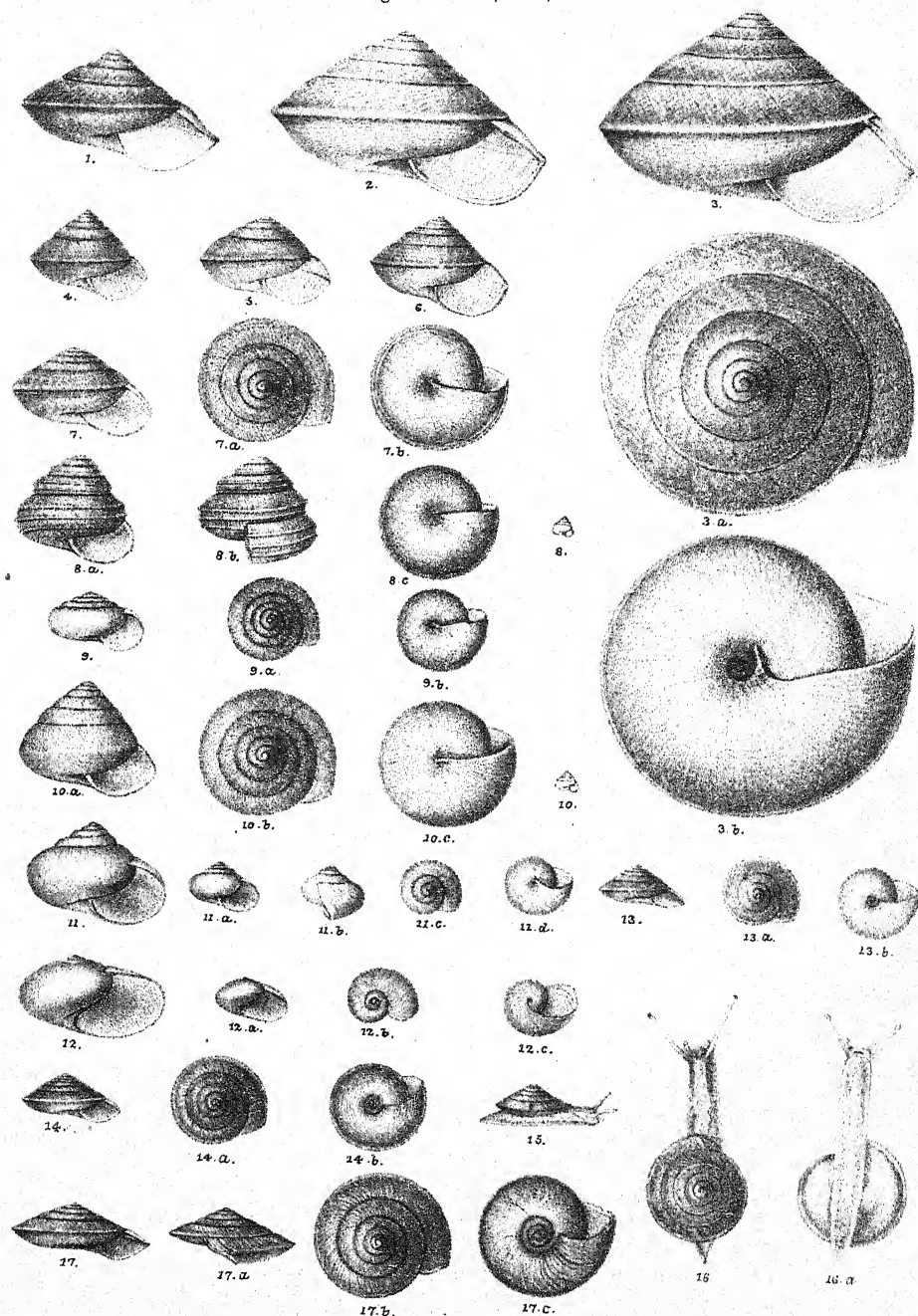
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4-7 *Rotala bifuga*.

8. *Sitala carinifera*.

9. *Macrochlamys stephoides*.

10 *Microcystis palmicola*.

Fig. 11. *Helicorion permolle*.

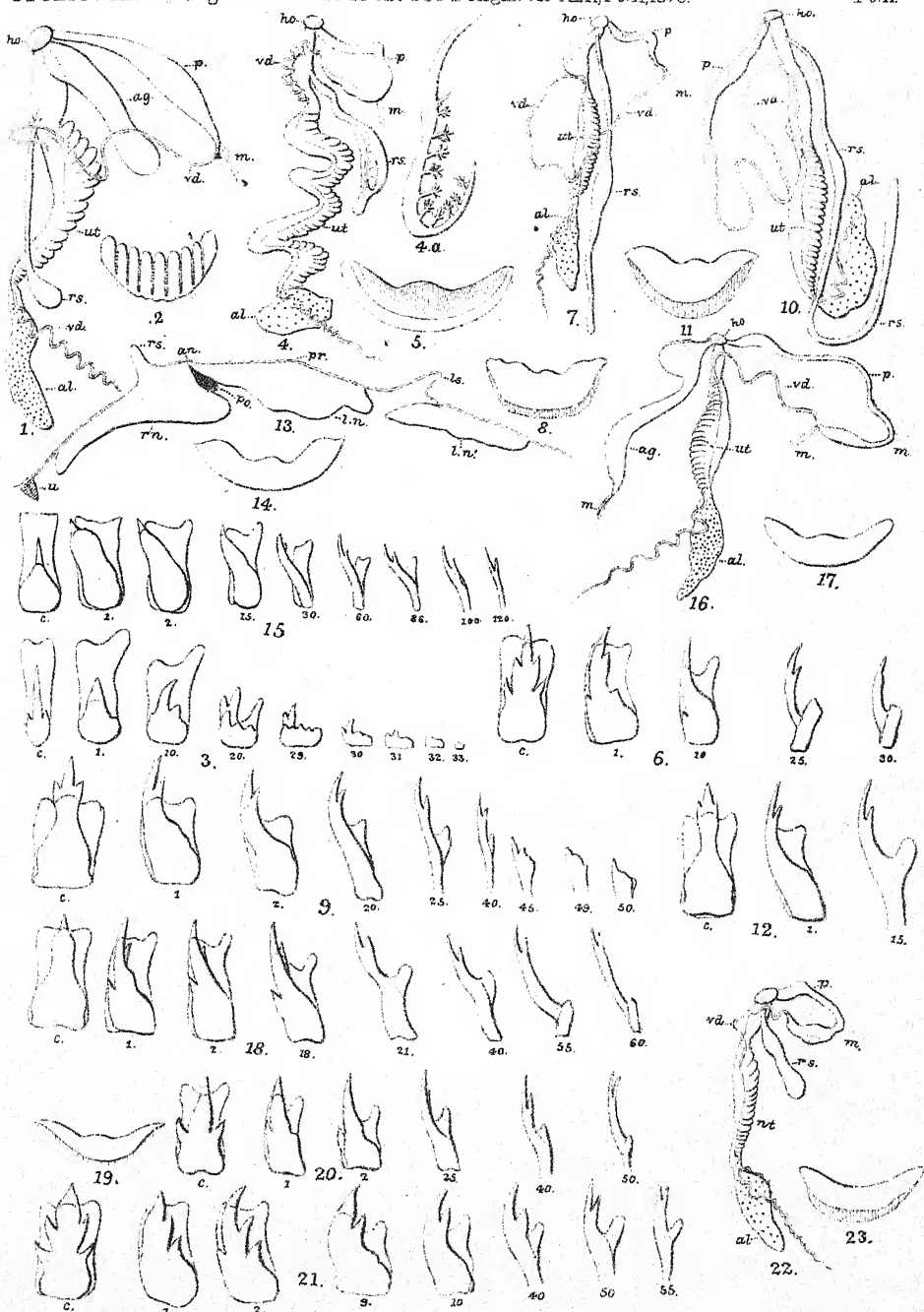
12. *Vitrina nucleata*.

13. *Trochom. Cantorianae*.

14-16 " *Castra*.

17. " *Timorensis*.

For further explanation see p. 37.



1-3. *Fraticicola similis*, p. 26.

4-5. *Vitrina nucleata*, p. 23.

7-9. *Trochomorpha castro*, p. 21.

10-12 " *Timorensis*, p. 22.

13-15. *Rhyssota cymatium*, p. 11.

16-18. *Rotula byssa*, p. 14.

19-20. *Macrochl. stephoides*, p. 17.

21-23. *Helicaron permolle*, p. 18.

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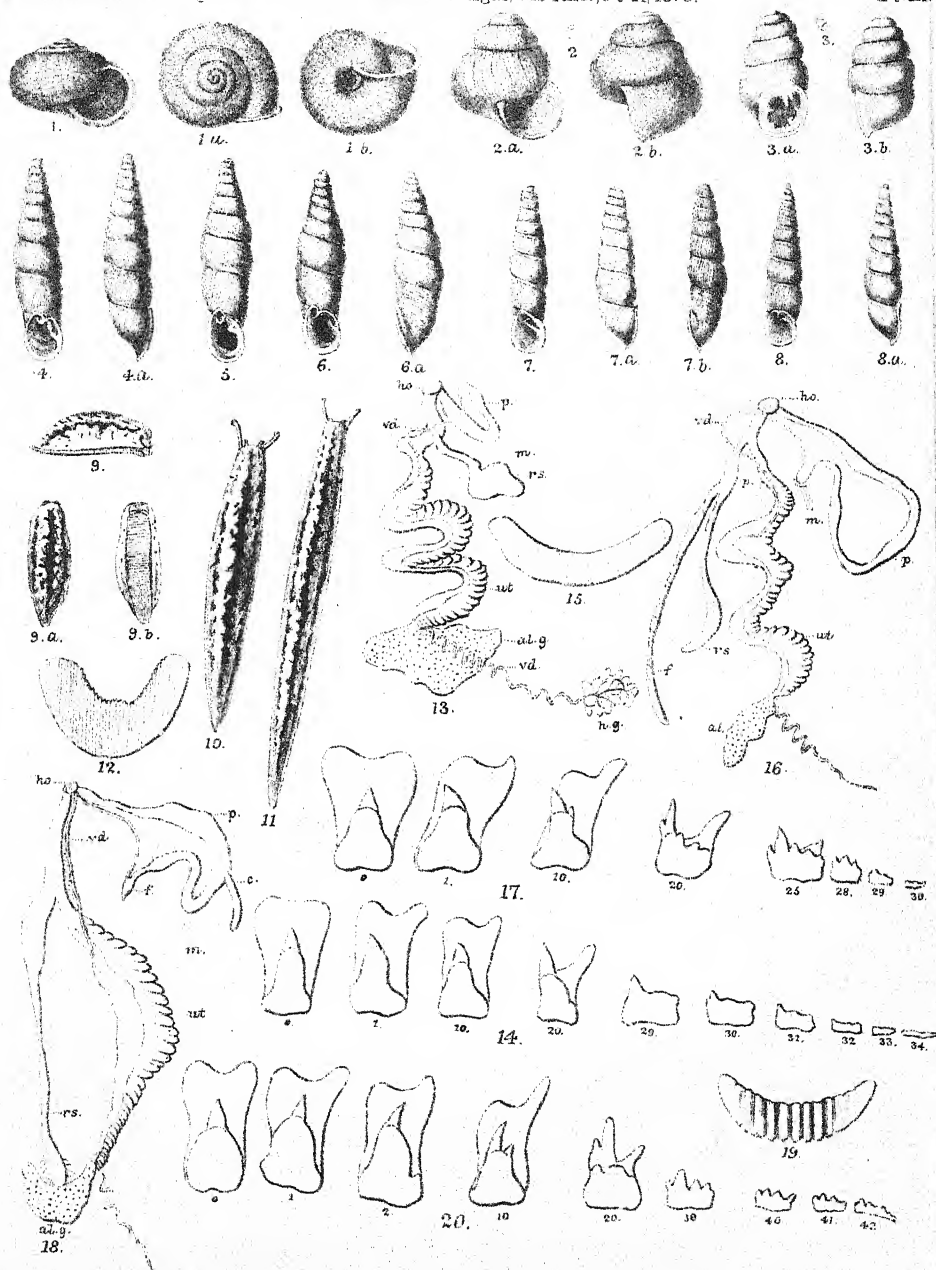


Fig. 1. 18-20. *Trachia Penangensis*, p. 24.

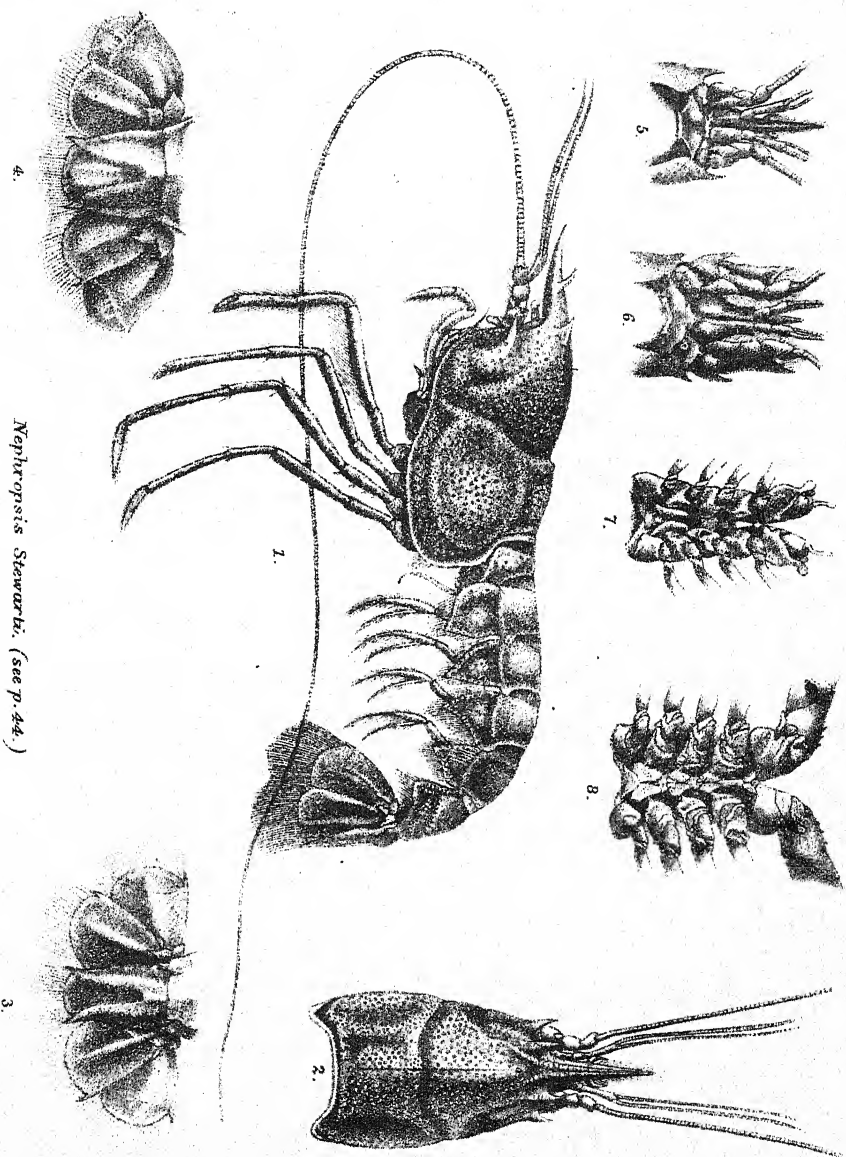
" 2. *Pupa orcella*, p. 33.

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7-8. *Clausilia filicostata*, p. 28.

9-14. *Philomycas pictus*, p. 30.



*Nephropsis Stewarti.* (see p. 44.)



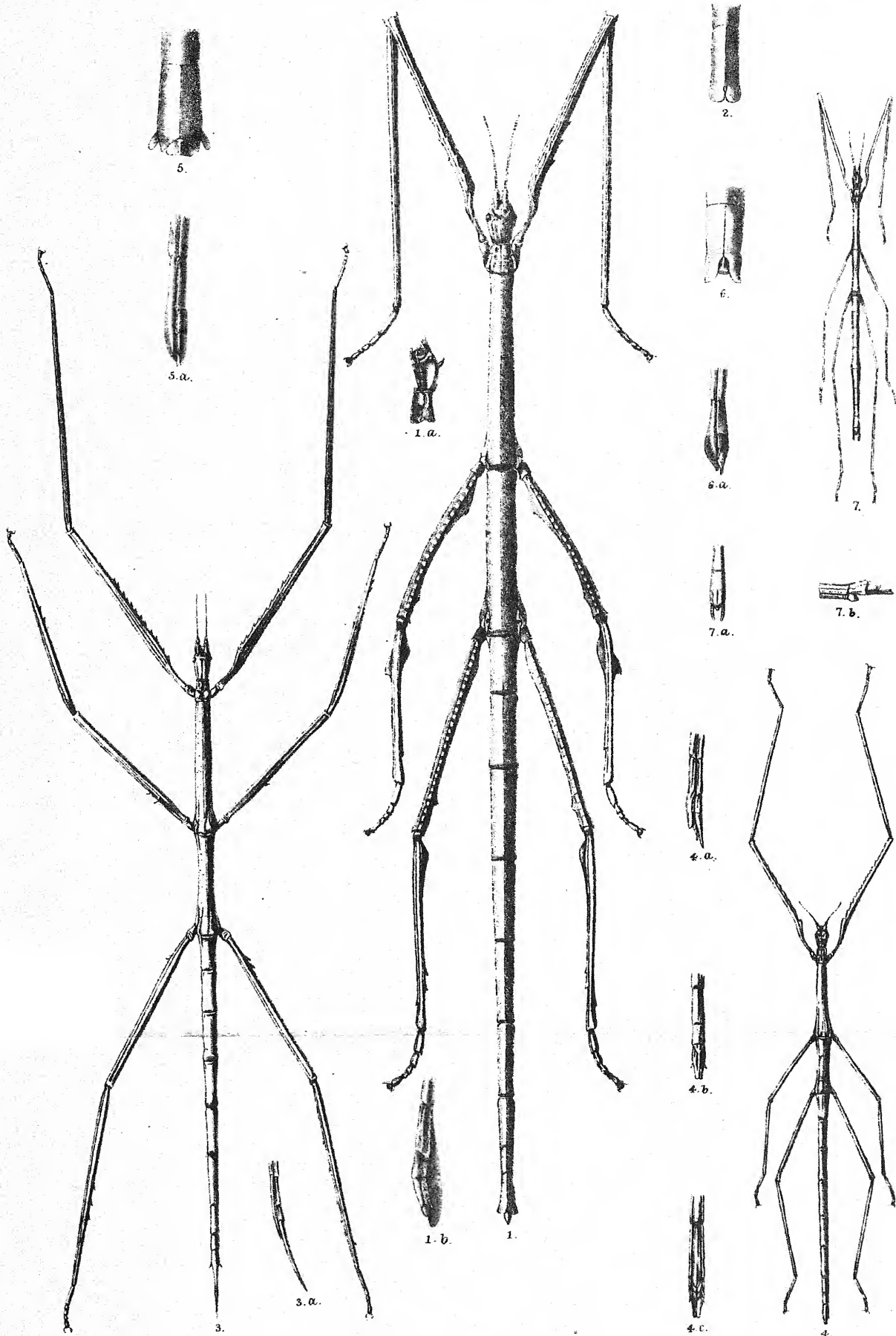


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Fig 7. *B. fuscilineatus*, p. 46.

For further explanation see p. 56

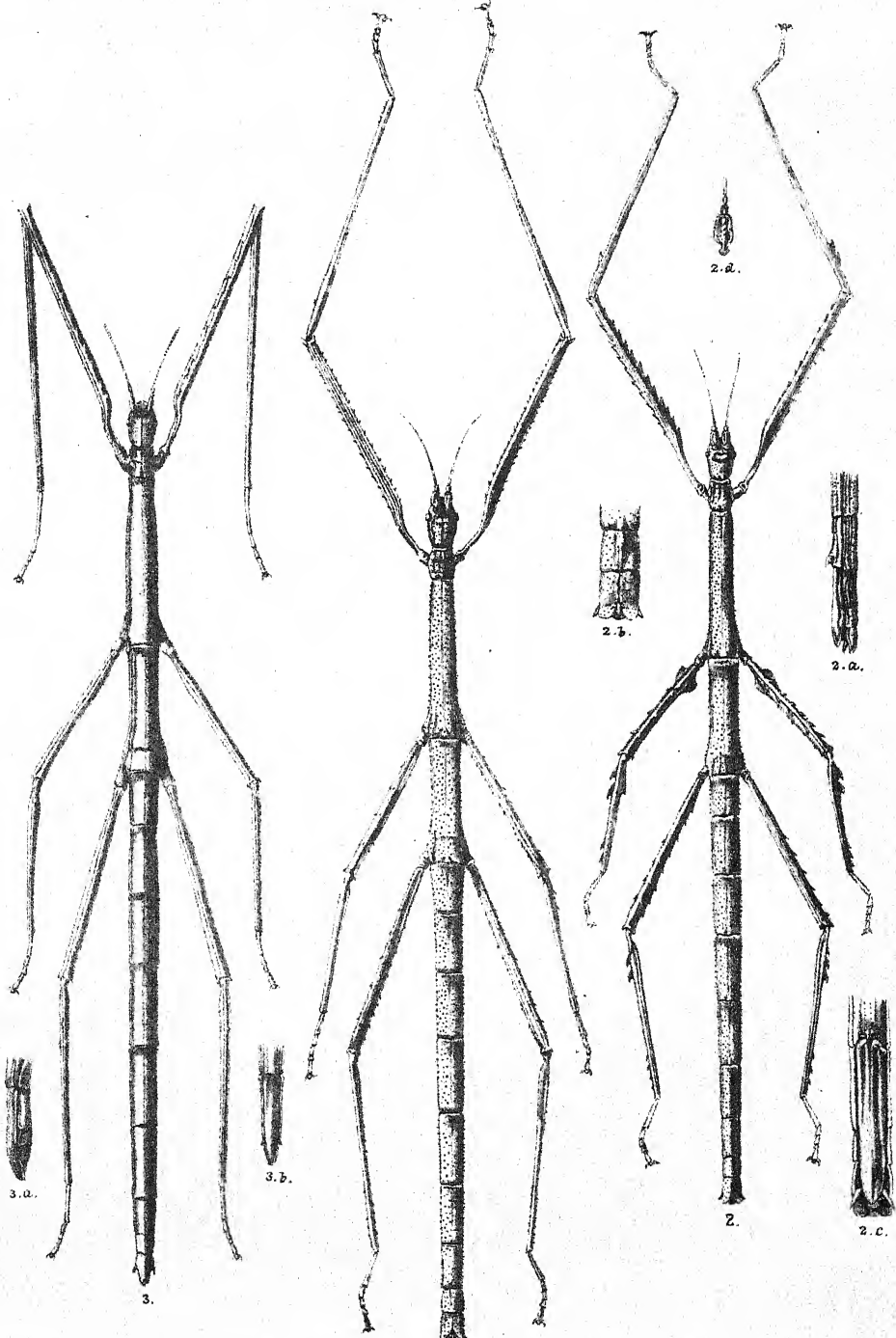


Fig: 1-2. B. Artemis, p. 51. Fig: 3. B. Westwoodii, p. 50.  
For further explanation see p. 56.

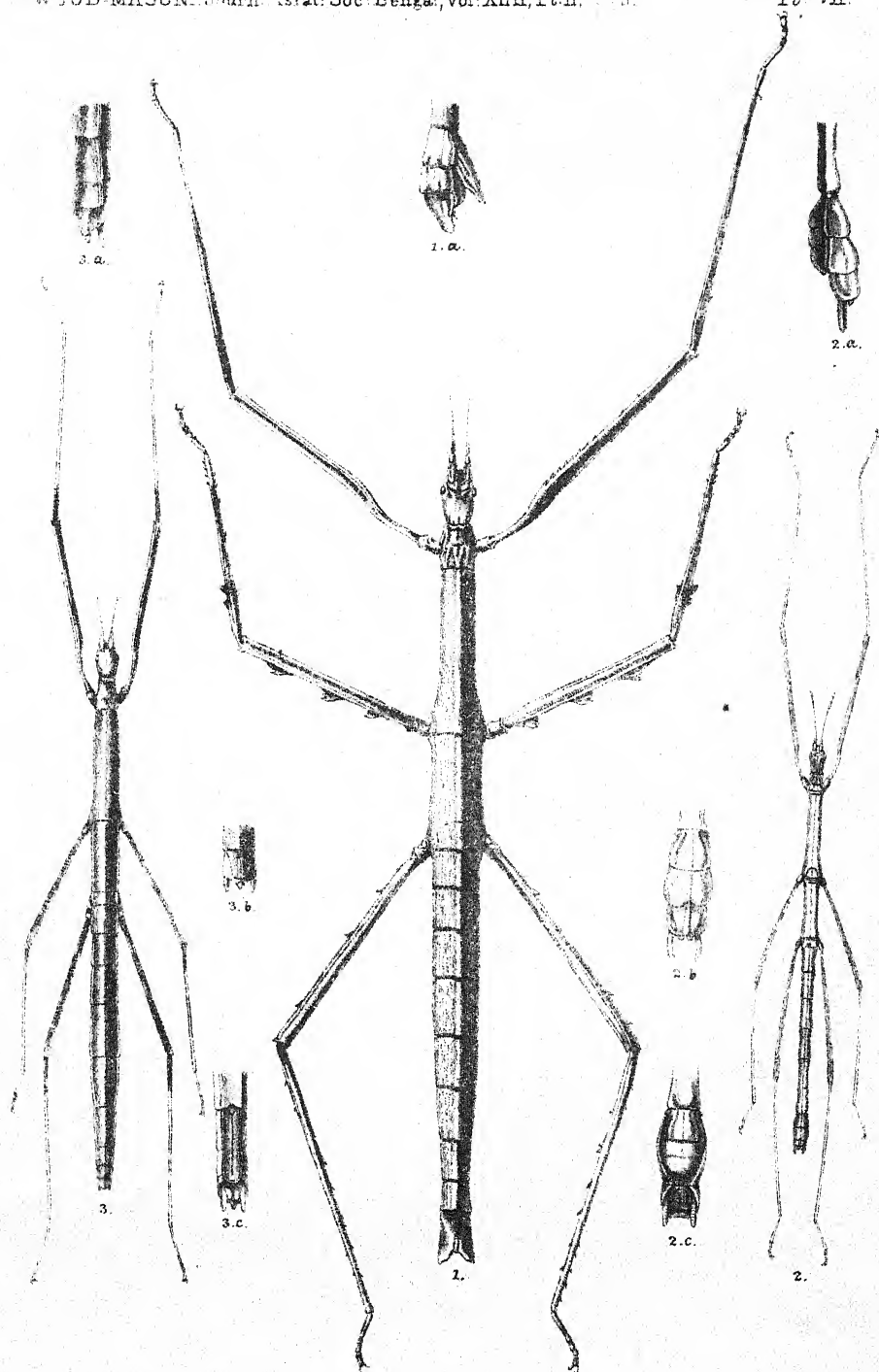
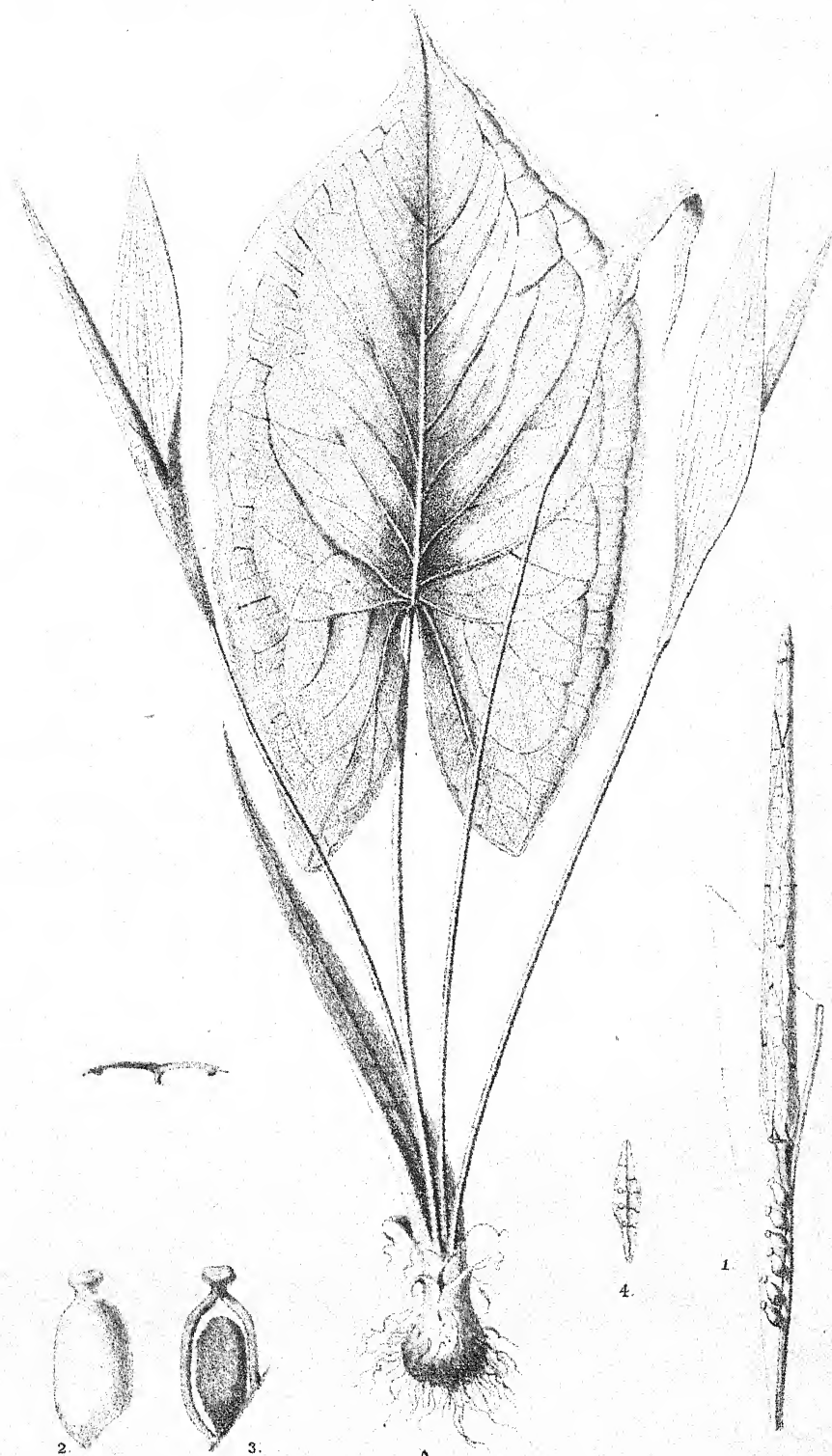


Fig. 1. *B. scabriusculus*, p. 55. Fig. 2-3. *B. hispidulus*, p. 47.

For further explanation see p. 56.



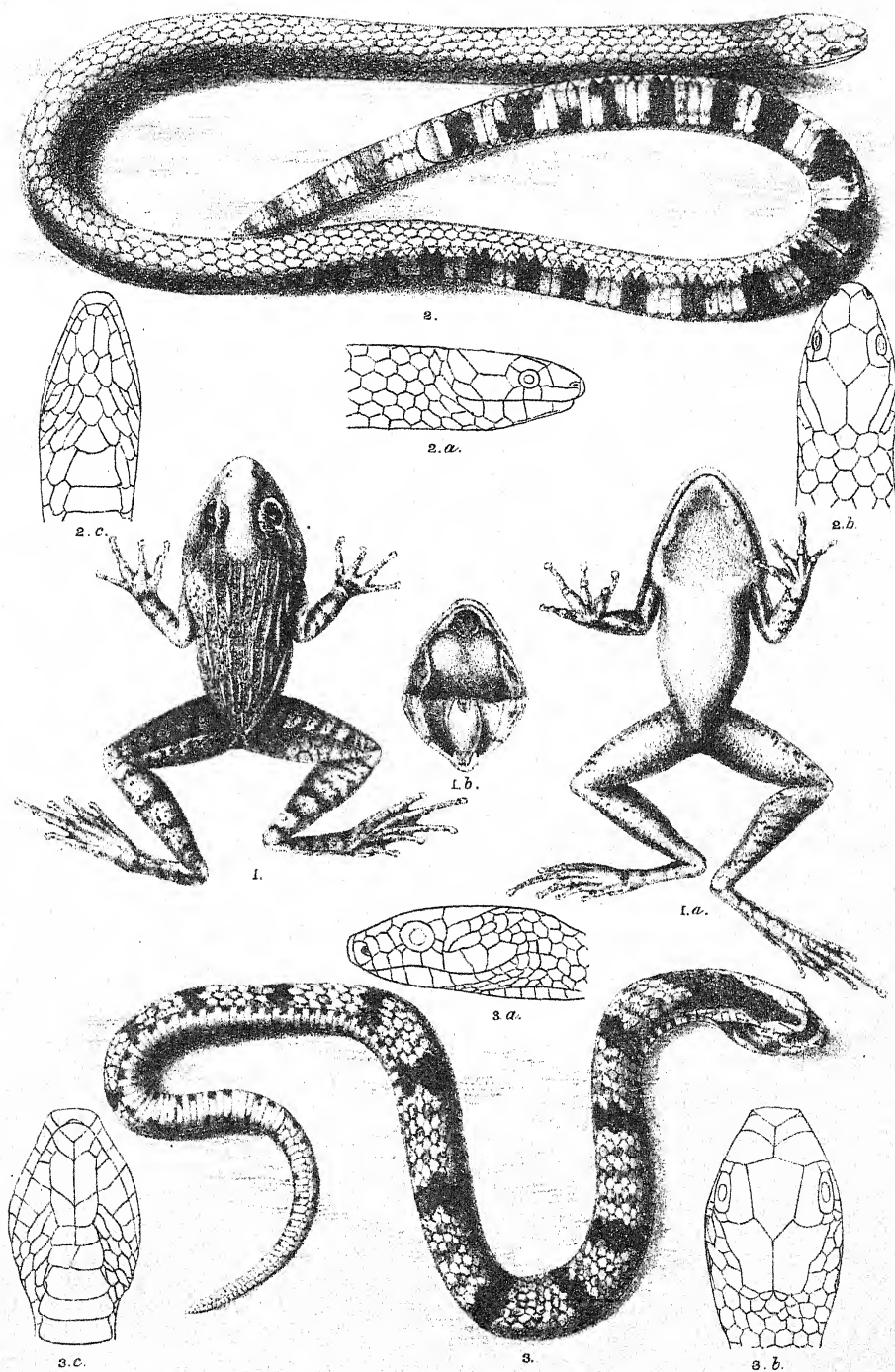
*Hemiorchis Burmanica*, Kurz.



A.  
*Homalium Benthamiana*, Schott





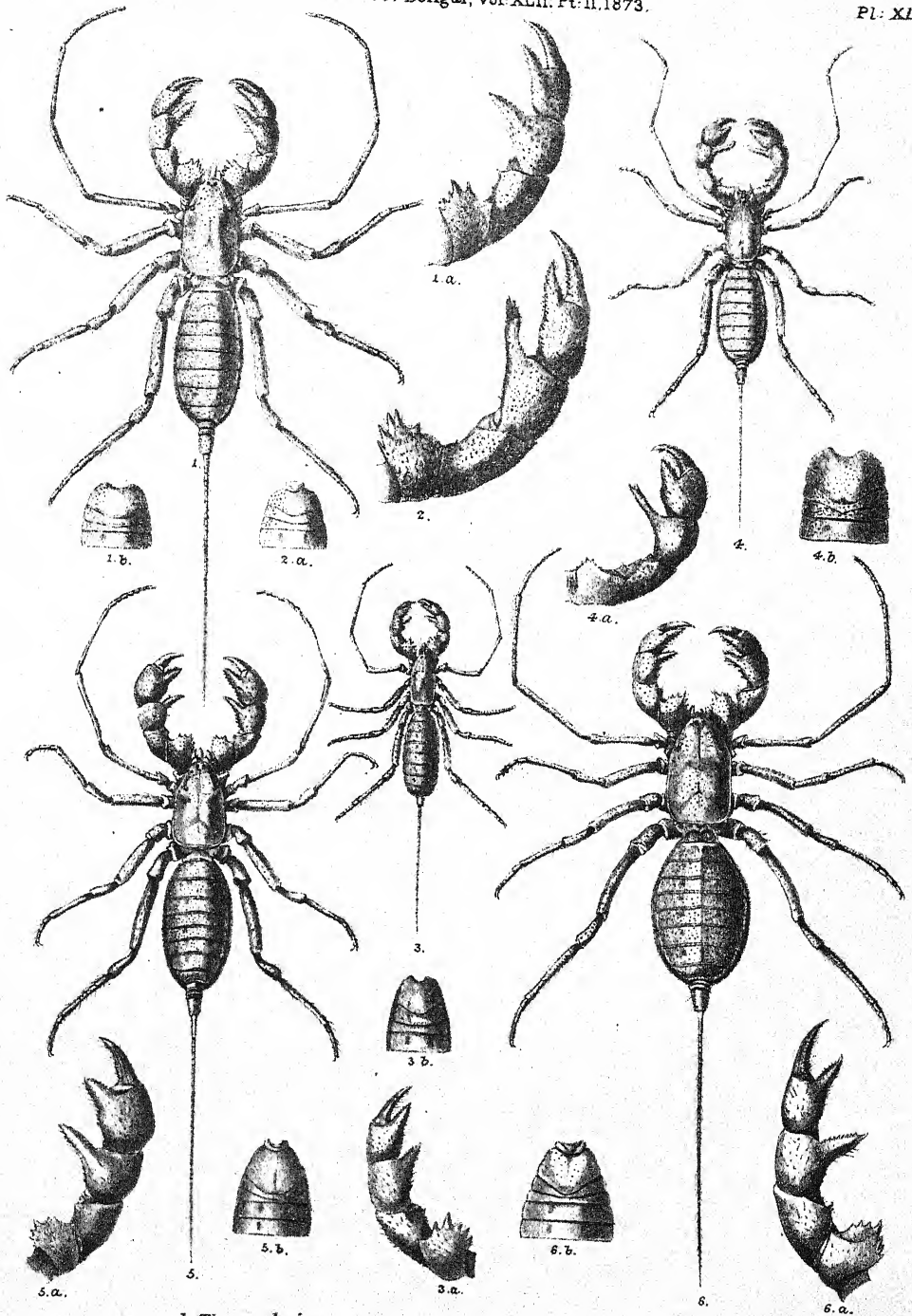


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1. Th. *scabrinus*, p. 130.

2. Th. *Assamensis*, p. 133.

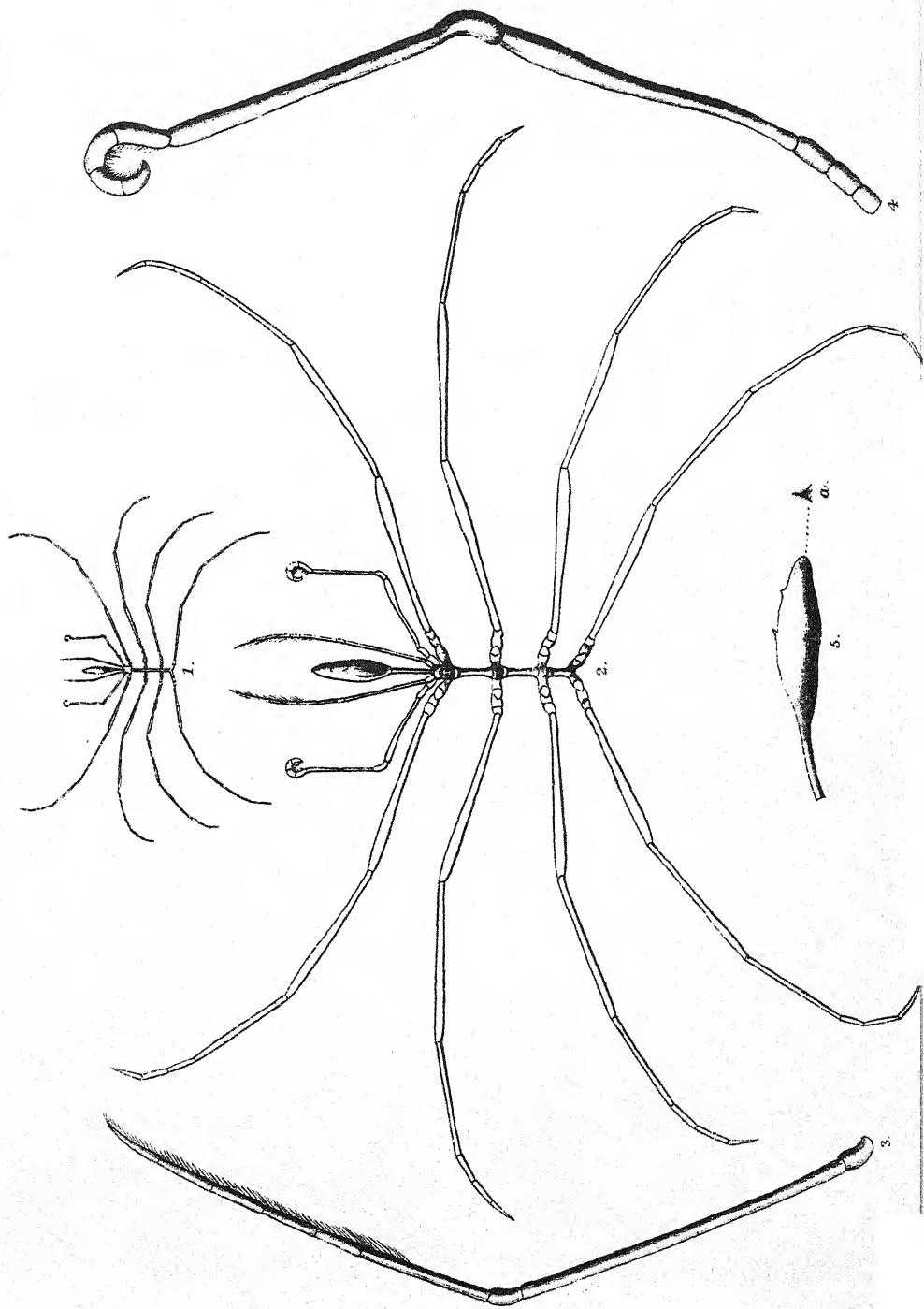
3. Th. *(conf.) angustus*, p. 134.

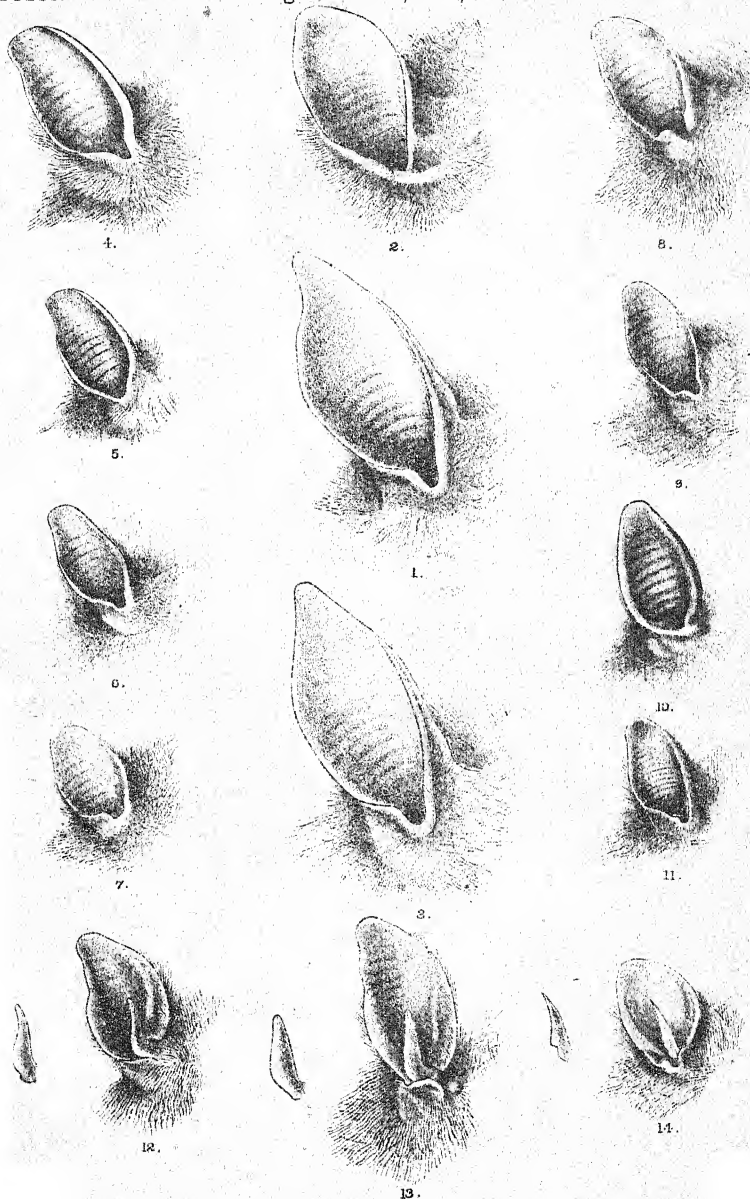
4. Th. *formosus*, p. 137.

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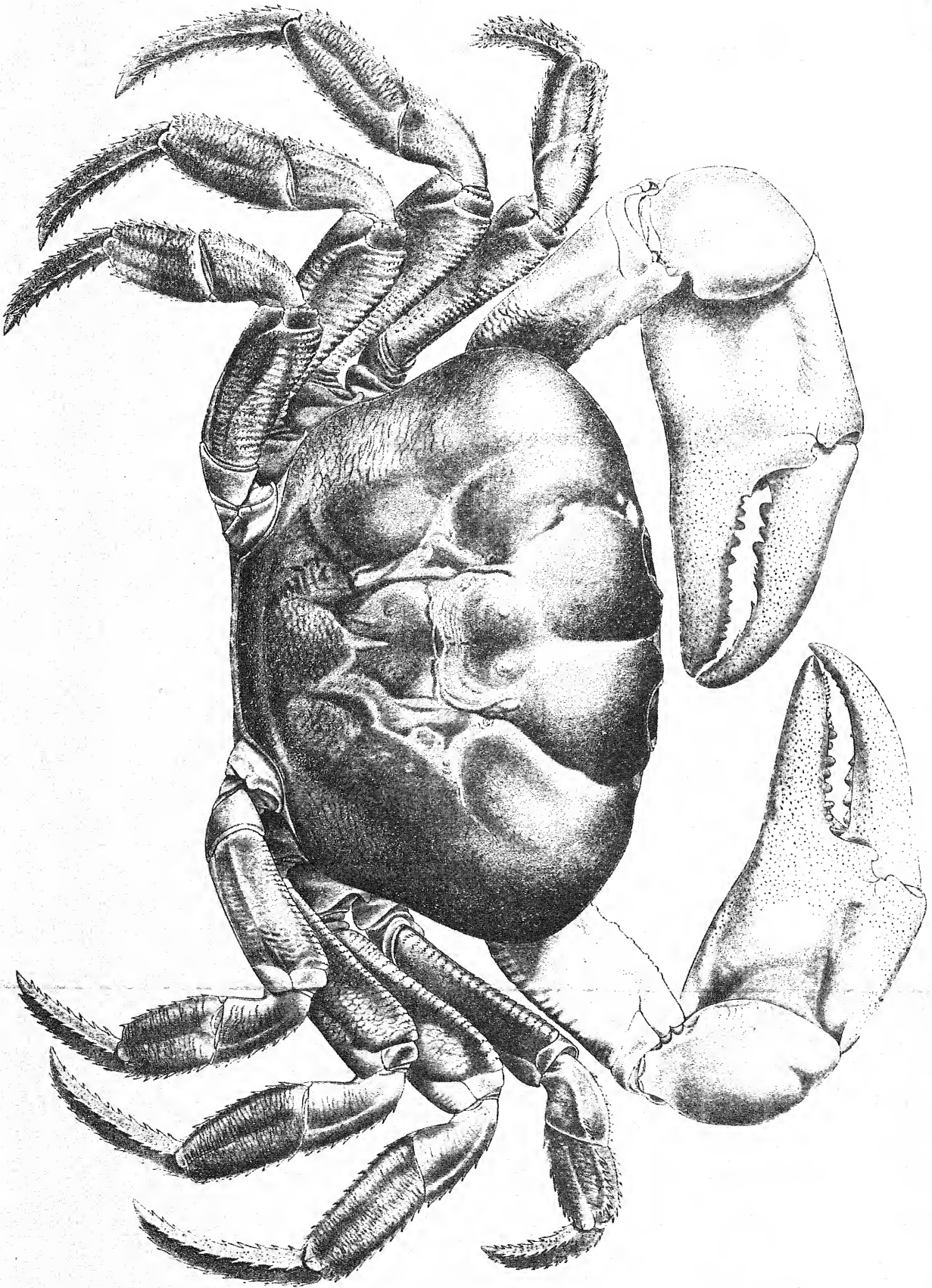
6. Th. *Beddomi*, p. 142.

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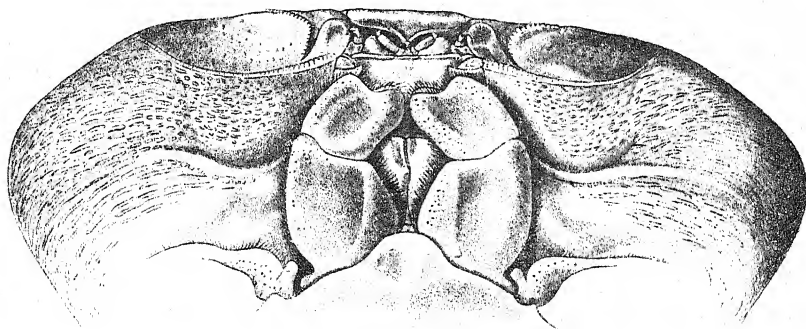




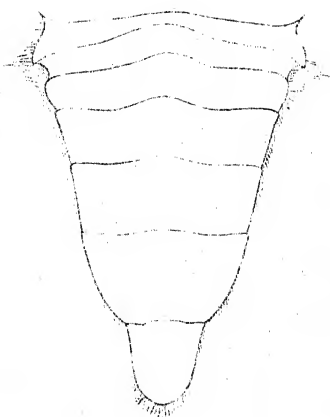
1. *Pteropus medius*. 2. *Pt. nicobaricus*. 3. *Pt. edulis*.
4. *Cynopterus marginatus*. 5. *C. marginatus*, var. *andamanensis*.
6. *C. sherzeri*. 7. *C. brachysoma*. 8. *Cynonycteris anplexicaudata*.
9. *C. minor*. 10. *Eonycteris spelea*. 11. *Macroglossus minimus*.
12. *Vespertilio murinoides*. 13. *V. murinus*. 14. *Murina cyclotis*.



HYLAEOCARCINUS HUMEI.



1.



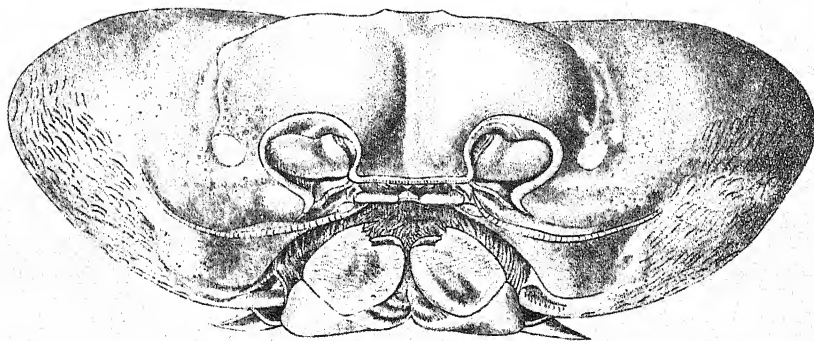
3.



5.



4.



2.

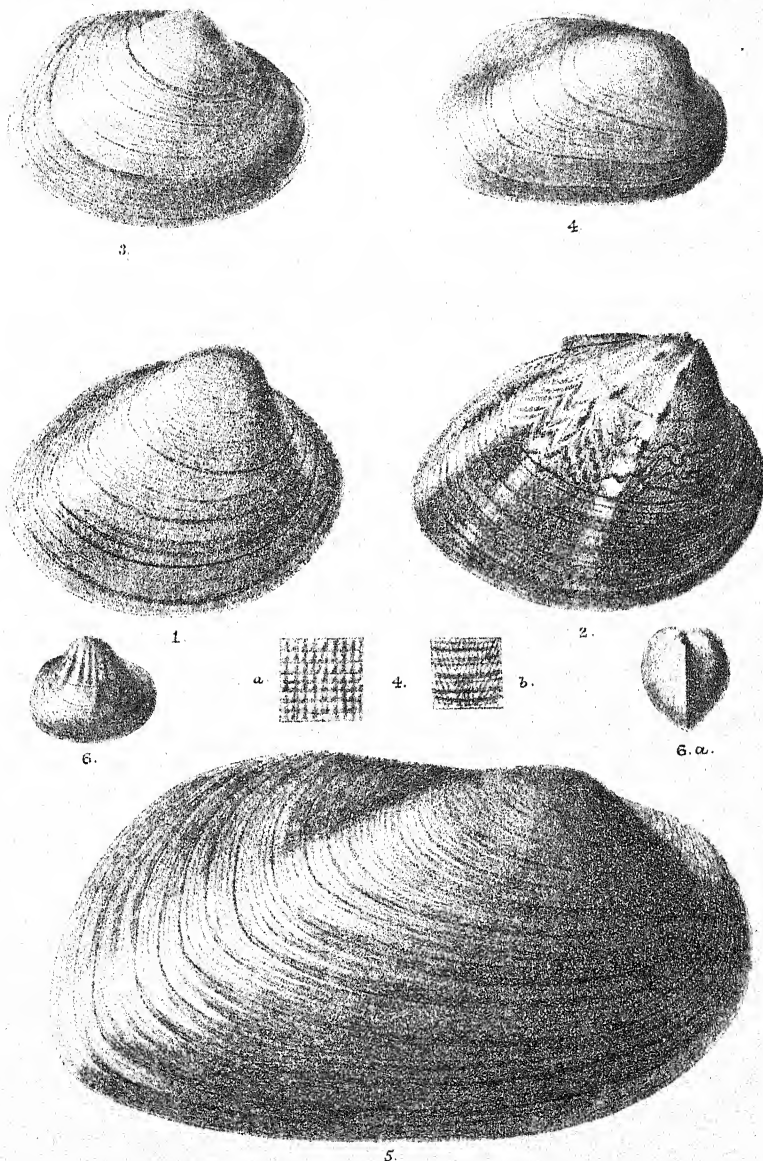


Fig. 1. *Unio Bhanoensis*.

2. *U. Mandalayensis*.

3. *U. Peddani*.

Fig. 4. *Unio Gowhattensis*.

4.b. *U. crispiculatus*, Bens.

5. *Monochondylaea Awa*.

Fig. 6. *Sphaerium Avannum*.



